DIGITAL LIBRARY PROGRAMS
FOR LIBRARIES AND ARCHIVES

Developing, Managing, and Sustaining Unique Digital Collections

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Online collections of unique primary source library materials are what distinguish today's libraries and archives. In the past decade, many digitization projects matured into digital library programs. Economic downturns and stretched budgets, however, have made the expansion of digitization programs difficult, if not impossible. Libraries and archives of various sizes are struggling to keep their digitization initiatives active. At the same time, many institutions with limited staff and resources have been asked to begin digitization programs to highlight their unique materials and serve their diverse constituencies.

Library and archives leaders are searching for practical approaches to begin or enhance digitization efforts at their institutions. Like others, they want to develop sustainable digital library programs that emphasize their unique materials. Digital Library Programs for Libraries and Archives: Developing, Managing, and Sustaining Unique Digital Collections provides librarians and archivists with an overview of today's digital libraries, strategies for managing digital projects, and a simple step-by-step workbook approach to creating a digital library project plan for their institutions. That plan is a road map to transforming digital library projects into sustainable digital library programs.

This book distills the existing literature and best practices on digitization and provides readers with a snapshot of today’s digital library landscape. It also gives readers clear instructions for creating a plan for establishing their own unique digital collections.
digital library programs, even if they have yet to purchase a scanner or have thousands of TIFF files languishing on a hard drive. *Digital Library Programs for Libraries and Archives* is a resource designed to appeal to information professionals who are responsible for developing, managing, and sustaining their institutions’ unique digital collections.
In 2012, I first taught an online course on digitization projects for the University of Wisconsin. I based the course on my experiences creating and managing grant-funded digitization projects at the University of Tennessee and also from maintaining long-running digital projects at Virginia Tech. The class focused on the digitization of unique archival and historical materials. The students in the course ranged from librarians in large academic institutions to part-time library assistants working in rural public libraries. The pressing need or professional interest to jump into digitization planning motivated the students to take the class. I taught the course two more times and expanded the content into a graduate-level digital libraries course at the University of Tennessee.

My courses emphasized the importance of having a realistic plan, following the plan, and adapting the plan. Each week students worked on different components of an existing or planned digitization project. At the end of the course, each student combined those assignments and prepared a digital project plan that covered the core elements of any digitization initiative. More than just a simple one-time assignment, the exercise was designed to create a practical document that students could actually use in the following weeks, months, and years. The development of a plan also allowed students to understand the balance between the big-picture theory of digital libraries and the daily realities of managing the digitization of library and archival materials for their institutions.
Teaching a course on digitization projects to several dozen students demonstrated to me that there are hundreds, if not thousands, of librarians and archivists who want practical advice about managing digitization projects for their institutions. I learned that the literature on digitization planning is dispersed and that there is no single comprehensive source covering the big-picture issues associated with planning, building, and sustaining digital initiatives in libraries and archives. The most important lesson from teaching the course was that starting a digital project is much easier than sustaining it. Moving from project to program and making digitization an ongoing part of library or archival operations are the main ingredients to successful digital initiatives.

My experiences teaching and building digital library collections in an academic setting form the basis of this book. There is a demonstrated need for a step-by-step approach to creating and managing digital library programs. Archivists, librarians, other information professionals, and students are faced with the realities of starting and managing digitization efforts. Many times they have limited resources, little technical training, and no clear idea of how to start. This book provides a current overview of digital projects and offers a replicable method to plan for ongoing digital programs. Today, digitization of unique materials and the management of digital assets are top priorities for librarians and archivists. The challenge is to make building and managing digital collections a permanent and sustainable part of regular library and archival operations.

**Defining Digital Libraries**

A digital library is a broad concept with multiple definitions. At the most basic level, a digital library contains collections of electronic information that can be searched and retrieved. Digital collections contain a variety of file types or formats. The structure of the digital content determines how the materials can be searched and accessed. Access to digital libraries depends on whether the content is made public through the Web or limited to specific users through log-ins or an internal network. Digital libraries connect dispersed information resources and allow users access to that content, most often through a simple Internet connection.1

From the perspective of a librarian, a digital library is an extension of traditional library collections and services. Electronic library catalogs are the most common type of digital tool for searching and accessing library resources, but
today’s libraries have a variety of other digital access points and collections. Librarians select, create, and organize electronic information for use by their researchers. These types of digital collections include e-books, journal backfiles, data sets, databases, and locally created content. Librarians train their users how to use digital resources, provide virtual reference assistance, and offer training on data management and curation. Many libraries manage institutional repositories, which are a type of digital library. These repositories feature a wide range of digital content, including online journals, research data, and other open-source materials designed to foster scholarly communication and inquiry.²

For archivists working in academic, private, or government settings, a digital library represents an online option for providing access to archival and historical materials without a visit to the reading room. Because of security and preservation concerns, archival materials do not circulate, cannot be browsed in the stacks, and may have use restrictions. Archivists are responsible for protecting the original materials under their care. Digitizing original materials and placing the digital surrogates online opens up access to anyone with an Internet connection. The ability to search digitized content from many collections, often housed at different repositories, broadens archival research and inquiry. The different formats such as textual documents and photographic images, the unique arrangement of each collection according to provenance, and the absence of descriptive information are just a few reasons why digitizing archival materials is challenging.³

In only a few decades, digital libraries changed the way that people access information resources. Digital technology also changed the mission of libraries and archives. No longer just repositories for printed or analog materials, libraries and archives of all sizes create digital content for their users. Librarians and archivists are significant contributors to digital libraries. Information professionals create new digital collections, manage existing electronic materials, work with the creators of digital content, oversee the production of digitized materials, and adapt new technologies to increase access to information resources.

Existing Literature

The professional literature on digital libraries is diverse and growing. Since the 1990s, scholars and practitioners have produced studies on digital libraries that
range from technical surveys on information structure to how-to guides on scanning materials. The challenge has been to publish books and articles that remain relevant. The rapid pace of technological change, especially in the area of technical standards and equipment, makes many sources obsolete within a few years. The most useful and long-lasting texts review the basic concepts and components of a digital library, with a balance of theoretical and practical discussions.

A number of computer scientists have written overview textbooks on digital libraries. Michael Lesk’s *Practical Digital Libraries* (1997) and the revised edition titled *Understanding Digital Libraries* (2005) approach digital libraries from a technical and computer science perspective. In these two books, Lesk describes the basics of building a digital library and reviews the significance of digital libraries in society. Lesk focuses on the technology and information structure needed to support a digital library, and on how resources and institutional policies affect the decisions made when planning a digital library.4

In *Introduction to Digital Libraries* (2003), G. G. Chowdhury and Sudatta Chowdhury look at digital libraries from an international perspective. They review the technical components and information infrastructure of a digital library, while also noting the importance of social, economic, and political factors in building and managing digital initiatives. The book emphasizes that digital libraries have changed the way that people communicate, seek information, conduct research, and interact with others across the globe.5

In *How to Build a Digital Library* (2010), Ian H. Witten, David Bainbridge, and David M. Nichols review types of digital collections and the information architecture needed to build and maintain a digital library. The book explores the importance of libraries and librarians in the planning and implementation of digital initiatives. The authors provide an overview of digital libraries but also include instructions to build digital collections using the open-source Greenstone Digital Library Software. With a mix of technical and practical advice, the lengthy book has appeal for global audiences interested in starting digital library programs.6

Librarians and library science educators have contributed to discussions about digital libraries, especially the role of digital libraries in society. In *The Whole Digital Library Handbook* (2007), Diane Kresh presents an array of short essays about how libraries of various sizes have built digital collections and other electronic information resources. The book asserts that the proliferation of digital libraries and new technology have created an unparalleled opportunity for librarians to redefine their roles as information providers. With these
new digital initiatives, Kresh argues, libraries can build significant research collections for a wide range of users.7

Karen Calhoun’s Exploring Digital Libraries (2014) traces the history of digital libraries and analyzes some of the social effects of online information. She argues that digital libraries represent an important mechanism for worldwide collaboration to solve many of the social, technical, and economic problems of the twenty-first century. At the same time, Calhoun provides a clear snapshot of today’s digital library initiatives and possible directions for the next decade.8

Various books focus on the practical realities of building digital library collections. Abby Smith’s Strategies for Building Digitized Collections (2001) is an important review of early digitization efforts in academic and research libraries. She emphasizes the importance of digitization as a core function of libraries and the need to sustain digital collections in the long term. The book also discusses the process of selecting materials for digitization, with a nod to special collections and archival materials as being critical parts of digital collection development.9

A number of overview sources provide step-by-step instructions for managing digitization projects. In Handbook for Digital Projects (2000), editor Maxine K. Sitts reviews the different components of digitization. The guidebook encourages librarians involved in digital projects to follow best practices and technical standards.10 Similarly, in Digitizing Collections (2004), Lorna M. Hughes emphasizes the importance of initial planning before any digitization begins. The book encourages librarians and archivists to seek out partners and share resources when possible.11 Stuart D. Lee’s Digital Imaging (2001) also provides the basics of managing a digitization project. It reviews how the choices of formats for digitization affect other parts of the project, such as needed equipment, metadata schemas, and staff expertise.12

Rebecca L. Mugridge’s Managing Digitization Activities (2006), a SPEC Kit published by the Association of Research Libraries (ARL), includes the results of a survey documenting digital projects at over a dozen academic libraries. The survey reveals similar challenges of digitization projects, and also different models for managing the work of digitization. Perhaps most important, the book includes internal documents such as organizational charts, mission statements, position descriptions, selection criteria, assessment guidelines, and other internal policies and procedures from the participating libraries.13

Other guidebooks focus on more technical aspects of digital libraries. In Building Digital Libraries (2008), Terry Reese and Kyle Banerjee cover the creation and management of locally created digital repositories. The book reviews the

Many sources on managing digitization projects pay particular attention to how to digitize specific formats or unique materials. Jill Marie Koelling’s *Digital Imaging* (2004) provides an overview of digitization projects, with a focus on scanning photographic materials. Similarly, Margot Note’s *Managing Image Collections* (2011) reviews best practices for digitizing visual materials, with an emphasis on approaches to adding contextual information. Mark Jordan’s *Putting Content Online* (2006) explains realistic approaches to managing digitization efforts. Unlike other digitization guidebooks, Jordan’s book discusses how to manage textual documents, sound and video, and data sets. More generally, in *Moving Theory into Practice* (2000), Anne R. Kenney and Oya Y. Rieger review methods to convert cultural resources into digital form. The book encourages the leaders of digital projects to secure external and internal resources to help make digitization part of their organization’s ongoing mission.

The successes and challenges of digital projects are featured in many books and articles on digital libraries. Allison B. Zhang and Don Gourley’s *Creating Digital Collections* (2009) provides an overview of how to build digital collections, with examples from digital projects around the world. Kwong Bor Ng and Jason Kucsma’s edited book *Digitization in the Real World* (2010) includes dozens of case studies from small and medium-sized digitization projects. The essays highlight projects from diverse cultural heritage institutions that overcame the challenge of limited resources. The book encourages the sharing of information, collaboration and partnerships, and following technical standards and best practices.

The emphasis on digitizing archival and historical materials is a consistent thread in the professional literature and the digital projects of the past twenty-five years. In most cases, archivists are involved in a wide range of digitization activities, especially the selection of the materials under their care for digitization. In *Archives and the Digital Library* (2009), editors William E. Landis and Robin L. Chandler present case studies from archivists working on digital
projects. The book emphasizes the critical role of archivists in digital projects.\textsuperscript{24}

The professional literature on digital libraries ranges from the practical to the theoretical. There are many sources on the management of digitization projects and how to build digital collections drawn from unique library and archival materials, but most are focused on individual digital projects that often end when funding or other resources expire. The more theoretical sources on digital libraries emphasize the importance of making digital collection building an ongoing and sustainable effort, but these books lack the details of how to manage digital projects in the long term. What is missing in the literature is a source that focuses on building and sustaining digital library programs. More specifically, there is no one source that provides practitioners with a theoretical overview of digital libraries, a step-by-step process to build digital collections, and a clear strategy to transform digital projects into sustainable digital library programs.

**Organization and Purpose**

This book covers how to build and maintain digital library collections in today's libraries and archives. It provides an in-depth discussion of digital libraries, how they developed, and the current challenges. Second, the book details the key components of digital projects, specifically those that digitize historical, archival, or other unique materials. Finally, it provides a step-by-step method to create a digital project planning document that can be adapted and reused as needed. In its entirety, this book covers the steps and planning needed to develop digital projects and full-scale digital library programs.

The theory and reality of digital libraries are the focus of the first section of the book. The first chapter reviews the growth of digital libraries and the importance of those digital foundations. The second chapter looks at the larger context of today's digital libraries, especially current technological challenges. These chapters identify significant trends in libraries and archives that affect planning digital libraries, and how librarians and archivists adapt to the changing information landscape. The third chapter reviews the basics of planning and managing digitization projects. These big-picture topics represent the challenges of leading successful digital programs.

The second section of the book is a topical step-by-step guide to digital library planning. It focuses on the daily operations and planning for digitization projects and, more importantly, how to transition from individual scanning projects
to ongoing digital programs in libraries and archives. These short chapters are devoted to the core components of digital libraries: vision and mission building; identifying resources and partnerships; evaluating, selecting, and building digital collections; metadata, best practices, and technical standards; management of digital projects; access, outreach, and instruction; promotion, assessment, and sustainability; and strategies to build digital library programs. These chapters provide a general overview of each topic and concludes with common questions. The intention of the second section of this book is for readers to consider the most significant aspects of building and maintaining a digital library and apply those principles to their digitization initiatives.

The third section of the book is the practical portion. It includes eight exercises for readers to complete. These practical exercises are connected to the topics in chapters 4 through 11. The final exercise is to take the results of the previous exercises and create a digital project plan that can be applied to real-world digital libraries. That plan is meant to be a living and adaptable document for existing efforts or projects still in development.

The main audiences for this book are librarians and archivists, both practicing and in training. The terms librarian and archivist are broad categories that include several types of information professionals. For the purposes of this book, librarians represent professionals who have responsibility for building collections of largely secondary materials and providing users with access to electronic resources. Librarians include more specific positions within a library such as catalogers, reference specialists, outreach coordinators, circulation staff, interlibrary loan officers, and administrators. The term archivist encompasses positions with direct responsibility for building and arranging collections of rare and original materials. Archivists can be rare books specialists, manuscripts curators, reference archivists, and special collections librarians. Archivists and librarians generally work in a private, academic, or government settings. These professionals work in different institutional settings, but the process of planning, building, and sustaining a digital library program is largely the same.

This book is designed to help librarians and archivists start digital projects, and also to help focus existing digital initiatives. Unlike other sources on topics related to digital libraries, this book combines theory and best practices with practical application. It focuses on building digital collections that are based on original or unique materials, but it is not just for archivists. Instead, librarians and other information professionals can use this book to build and manage digital collections. The book draws from experiences and case studies based on
digital projects in academic libraries, but the methods described are applicable and scalable to many different types and sizes of libraries and archives.

Digital collections are at the heart of digital library programs. Building digital collections from original and archival materials is not a new phenomenon, but there is a new generation of information professionals taking their first steps toward creating digital content. At the institutional level, there are many library and archives programs just beginning their digitization efforts. Further, archives and libraries with well-established digital credentials have legacy scanning projects that need to be updated and, many times, rescued from digital oblivion. The point of this book is to approach digital projects as an ongoing effort. The step-by-step approach in this book is designed to help librarians and archivists build, manage, and sustain unique digital content.

NOTES


PART I

The Theory and Reality of Digital Libraries
For centuries, libraries represented a physical space where users could access a comprehensive collection of information. The idea of a universal library, where all knowledge is stored and available to anyone, is a cornerstone idea of librarianship. With the advent of digital technology and the Internet, many librarians imagined creating a perfect and complete digital library, one that contains all of the information and knowledge in existence, which can be easily searched, retrieved, and consulted. The theory of digital libraries is that all of the needed components magically fit together easily and quickly, and suddenly there is a powerful tool that allows anyone to access the information he or she is looking for. In reality, however, building and maintaining a digital library is a complex process full of challenges and variables according to what resources and collections are available.

The shift from a print to a digital culture is perhaps the most significant and dramatic change over the past 50 years. The book, or codex, will never disappear as a medium to convey knowledge, but digital forms of communication cannot be ignored. Responding to change is a necessity for librarians and archivists. Even though many outside of the profession think of libraries and archives as static places, they are dynamic places. The point of these repositories is to actively record, document, and preserve available information for the users of today and tomorrow. Planning for future information needs is tricky, especially with fast technological changes. For example, in the 1990s, many librari-
ies invested heavily in CD-ROM databases and indexes as well as computer workstations to operate the software, but within just a few years, a majority of those electronic resources became available online and made the CD-ROMs and equipment obsolete.

The progression of electronic resources from single-use workstations to online subscription databases is just one example of how technology has changed the work of information professionals. Even more dramatic, in just over a single generation, most libraries have transformed from places to find books into information centers with access to online content maintained elsewhere. The growth of the Internet as an avenue to information is largely responsible for the rapid changes in libraries and librarianship. Many libraries and archives have created digital libraries and online collections for public use. The concept of greater access to information has guided many digitization efforts, especially in academic libraries.

There is a lengthy history of librarians and archivists responding to technological changes and the needs of their researchers, but those developments did not happen in a vacuum. The emergence of digital libraries occurred over many decades and because of contributions from several fields. This chapter provides a brief overview of the development of the concept of a digital or electronic library. It discusses how different professions approach the building of digital libraries, the challenge of changing technology, and the importance of original and archival materials in today’s digital project planning. The context of how digital libraries evolved into their current form helps librarians and archivists understand how to structure their digital collections and digital library programs.

**Brief History of Digital Libraries**

The development of digital libraries and the transformation of libraries occurred quickly, but the concept of having large amounts of information collected in electronic form took several decades to mature. Following World War II, researchers, scientists, scholars, and librarians put forward different ideas about how to manage information. Many books, articles, and presentations on the concept of an electronic-based library followed, with a handful having the greatest influence on the development of digital libraries in the early 1990s.

There is a tradition of writers and scholars predicting the future of libraries. Often these works influenced how libraries planned for new directions. Writ-
ers such as Edward Bellamy and H. G. Wells predicted that the libraries of the future would provide users with quick access to information. As the amount of information grew, they believed that technology would make it possible to store that content in different and smaller formats that could be easily retrieved. By the early 1940s, libraries faced this issue of growing print collections, shrinking shelf space, and massive cataloging backlogs.

Fremont Rider, head librarian at Wesleyan University, offered solutions to the flood of library information in his book *The Scholar and the Future of the Research Library* (1944). He asserted that growing print collections in research libraries could be managed through simple approaches such as collaborative interlibrary loan programs, a faster more streamlined approach to cataloging, and collection weeding. In the decades that followed, nearly every library used these approaches to manage their print collections. The majority of Rider’s book focused on a type of technology that offered the potential to shrink the physical size of printed collections. Rider believed that the microcard offered libraries the ability to store millions of books in reasonably sized cabinets. Library users would be able to access the collection by using a simple microcard reader. The microcard approach to collection management gained some popularity in the decades that followed, but that technology was eclipsed by the ability to store and retrieve electronic library resources using computers.

At the same time that Rider delivered a librarian’s view of the future, a government scientist and engineer presented a different way of managing the explosion of information after World War II. In 1945, Vannevar Bush’s article “As We May Think” appeared in *Atlantic Monthly.* Like many scientists from the war years, Bush believed that research should be used to improve society and not for destructive purposes. His visionary essay described and predicted many types of technological advances in communication, photography, and the storage of information. Similar to Rider, Bush embraced the idea of microforms as a way to store large amounts of library information in a small space, but he recognized that such an approach did not improve access to the materials. Bush acknowledged that only a handful of people “nibbled” at the great information resources found in research libraries.

Vannevar Bush had a vision. He believed that in the coming decades it would be technologically possible to build a logic machine that stored, searched, and retrieved data. The device, which he called a memex, would link data by association and not through traditional indexing. Bush postulated that library and information resources such as books, periodicals, newspapers, photographs, and even correspondence would be purchased on microfilm and loaded into
the memex by a photographic process. Then the person adding the information would type on a keyboard various codes to describe and contextualize the materials. Further, Bush explained that the memex would allow an individual to store and easily access his or her “books, records, and communications.” His concept of accessing data through a mesh of associative trails mirrors the structure of the World Wide Web, and the device itself sounds like a personal computer with an attached scanner ready for a digitization project. Bush predicted that such a machine would revolutionize the way that people shared information and result in significant scientific discoveries, better public health, and greater efficiency in society. Many of his predictions took several decades’ worth of technological advances to become possible, but the idea of associating and connecting information forms the basis of digital libraries and image galleries of fancy cats.4

The next significant work on electronic storage and retrieval systems for use by libraries came in 1965 with the publication of *Libraries of the Future.* The book, written by J. C. R. Licklider, an MIT computer science professor and early leader of the Defense Advanced Research Projects Agency (DARPA) within the Department of Defense, carried forward the ideas of Vannevar Bush. Licklider predicted that by 2000 libraries would be much different than they were in the mid-1960s largely because of the use of technology to harness and better organize the explosion of information. He believed that with electronic methods library information would become more accessible, organized both broadly and deeply, available to multiple users, and connected to other networks of information. Instead of relying on traditional library cataloging rules for books on shelves, the organization of the information would be based on associations with other materials instead of physical location. The book emphasized the importance of the users of libraries and how to best meet their information needs.5

In *Libraries of the Future,* Licklider made bold predictions about libraries that included a vision of digital libraries. He discussed topics such as creating electronic data, selection of materials, data entry, interdisciplinary research, faster processors, cheaper memory, multiple input workstations, descriptor-based retrieval systems, a stylus, automated card catalogs, and natural language searching. In his book and other publications, Licklider made clear that digital computers would change not only libraries but also society. His research focused on the interaction between humans and computers, and in the early 1960s, Licklider outlined an “intergalactic computer network.” His idea later became the first large-scale computer network, ARPANET (Advanced Research Projects Agency Network), which was the forerunner of the Internet.6
As government engineers created the first networks, technology companies built faster processors and more powerful computers with newly developed integrated circuits, known as computer chips. In the 1970s, the decreasing costs of equipment made it possible for companies to develop personal computers for the general public and not just large institutions or the government. It took several years for personal computers to gain popularity, but in the mid-1970s, a group of computer hobbyists took advantage of the availability of new low-cost technology. Many of these technology enthusiasts became multimillionaires as developers of software programs, computer equipment designers, and creators of operating systems.

The next significant pioneering work on digital technology came from the underground. Ted Nelson’s *Computer Lib/Dream Machines* (1974) brought together the threads of individual computer use and the potential to connect information through computer networks. Technically, these were two separate books bound together to show the interconnected nature of the topics, but more importantly, the publication served as an informal way of understanding computer use and the creative potential of the computer. While a graduate student studying computers, Nelson developed the concept of hypertext, which is linked electronic information that can be displayed at multiple levels. He expanded the idea into a larger computer network of linked information that he called Project Xanadu. In *Computer Lib/Dream Machines*, Nelson described the potential of linked information through computer networks and challenged readers to keep that power in the hands of individuals and not large companies or the government.

During the 1980s, a number of technological changes set the stage for the development of the first digital library projects a decade later. First, personal computers became more common because of their affordability. Greater familiarity with computers led to increased computer literacy. Second, libraries transitioned from index card catalogs to electronic library catalog systems. The ability to search for books and other materials at computer terminals, and later from home computers, changed the way that people used libraries. Finally, greater demand for computer networks for non-defense research purposes resulted in the expansion of ARPANET and management of the network by the National Science Foundation (NSF).

In the 1990s, a growing national computer network once reserved for use by the military, government, or academics became accessible to the public. Anyone with a personal computer could dial in to the Internet and have access to the World Wide Web. The Web consisted of hyperlinked documents, known as
webpages, accessible through a web browser, a type of software that facilitated searching and retrieval of electronic content. By the mid-1990s, commercial users overwhelmed the Internet and fueled an explosion of online commerce. In the next decade, Web 2.0 transformed static webpages into more robust and complex entities. The Web became much more interactive, with new tools to communicate and add multimedia content to webpages.10

Libraries and archives have responded to the technological advances of the past twenty-five years in a variety of ways. Following the conversion of paper-based card catalogs to electronic catalogs, libraries placed their catalogs online, built webpages, and moved many of their services to a virtual environment. The ability to combine catalogs from different institutions resulted in shared databases and resources. A number of larger academic and government libraries embarked on projects to digitize rare or out-of-copyright printed materials. The strength of these early digital projects was the ability to search difficult-to-find texts from multiple institutions.

Online access to scholarly content has challenged the traditional publishing model. In the 1990s, scholars began a movement toward open-access online publishing of scholarly materials. Their early work involved the development of local online repositories, where scholars could deposit their research findings and preprints. A majority of these projects came from the academic environment, as libraries partnered with campus departments such as computer science and information technology to develop the software and architecture for these first institutional repositories. As these open-access databases of scholarly information grew on many campuses, leaders of the movement established uniform standards for these repositories. This effort became known as the Open Archives Initiative (OAI), which is designed to provide efficient access to and dissemination of scholarly content.11

At the same time, journal editors contracted with online publishers to make their publications available through electronic means. Many of these publishers provide access to the content to subscribers only, but more recently, there is a trend among online publishers to allow free access to older content and backfiles. One of the first large-scale online journal publishing projects, JSTOR (Journal Storage), employed this hybrid model of access. JSTOR emerged as a pilot project at the University of Michigan and became a nonprofit organization in 1995. Today, JSTOR provides access to a variety of digital library contents, including journals, books, and primary sources.12

In the mid-1990s, even well-funded libraries had limited resources to devote to the research and development of digital initiatives. This reality resulted in
a number of consortial groups that secured federal grant funding for projects, established technical standards and best practices for digitization, and provided leadership for libraries and archives in the area of digital initiatives. The Digital Library Federation (DLF) was one of the first such groups. Founded in 1995 as part of the Council on Library and Information Resources (CLIR), DLF started with just over a dozen institutions and expanded to over 100 members with the intention to create an open distributed digital library. Other efforts to centralize digitization of and access to library materials also occurred at the state level, with state digital library programs in California and Colorado as early examples.13

Approaches to digital projects based in libraries and archives were as varied as the projects themselves. Funding for projects came from federal grants, private sources, or reallocated internal resources. Institutions approached the needs of staffing, equipment, server space, and training in different ways. Some libraries established digitization units, while other libraries chose a more decentralized approach with participants scattered across numerous departments or other organizations. Libraries invested the most time in selecting content, describing the materials, creating search engines, building external partnerships, and following best practices and technical standards. Many of the first digital projects focused on the most unique and rare items in archives, which established the practice of selective digitization and the idea that providing access to a digital surrogate would decrease the handling of the physical object. Over time, librarians and archivists experimented with other approaches to digitization, such as scanning entire collections. Also, the digital preservation, migration, and curation of electronic files from early digital projects became a crucial part of long-term planning for digitization programs in libraries and archives.14

The preservation of digital library projects and other web content is the focus of several ongoing projects, most notably the Internet Archive. Since 1996, this nonprofit organization has focused on preserving and providing free online access to a wide range of digital content that was often abandoned or removed from the Web. Currently, the Internet Archive provides access to over 450 billion webpages, over 7 million public domain books, nearly 2 million videos and films, over 2 million audio recordings, and the world’s largest collection of historical software. This significant collection of digital history provides ongoing access to content that documents the thirty-year history of the Internet.15

As nonprofit institutions digitized and preserved materials, commercial enterprises became involved in building digital libraries. Google.com, perhaps the most ubiquitous online company and search engine of choice, initiated a
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