II

Overview: Rationale for Digitization and Preservation

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This chapter provides a foundation for understanding the preservation implications of digital conversion projects. Following a brief description of the advantages and disadvantages of digital technologies, the author defines preservation in the digital context and describes how the underlying principles of traditional preservation practice relate to the creation of digital products. The key to successful digital conversion programs is the relationships among three concepts: (1) the purposes that the digital products will serve, (2) source document characteristics, and (3) technology capabilities brought to bear during the conversion process. At the heart of the digital conversion enterprise is this author's assertion that "preservation is the creation of digital products worth maintaining over time." Preservation in the digital context is separate from but integrally related to preservation actions taken on original source materials. The chapter ends with a reiteration of the idea of *responsible* custody, a highly relevant idea articulated over fifty years ago to describe the central role of preservation in cultural institutions.

Introduction

In *Motel of the Mysteries*, illustrator David Macaulay (1979) speculates about how people 2,000 years from now might interpret the cultural significance of a low-budget roadside motel, **Toot 'n C'mon,** buried intact under junk mail and pollution. Beyond being a wry satire on the science of archeology, the book is a clever reminder of the danger of trying to interpret the past without documentary evidence. A *Do Not Disturb* sign becomes a sacred seal "placed upon the handle of

the great outer door by the necropolis officials following the closing of the tomb." A charge card becomes "a portable shrine which was to be carried through life and into eternal life." A television represents "the essence of religious communication." Archeologists and historians know that the impulses to record and to keep are practically a part of our human nature. Truth is embedded in the symbols and artifacts that we create and then keep by choice or by accident. And yet, as the 21st century dawns, we find ourselves potentially confronting the dilemma of Howard Carson, Macaulay's amateur digger: a vast void of knowledge filled by myth and speculation. Information in digital form, the newest currency of our world, is more fragile than the fragments of papyrus found buried with the Pharaohs.

Digital imaging is 'hot.' Major daily newspapers devote entire sections on emerging trends in digital technology. Notwithstanding the results of recent surveys of the Web showing that the overall proportion (83%) of Internet content is commercial in character and that only six percent is educational or informational, the perception persists that everything of value is becoming digital or created in that form.

Digital images are indeed becoming commonplace in libraries and archives. The quality of digital image products can be spectacular. There is little doubt that quality will improve as the technology matures. Organizations are rearranging budgets, raising money, and anticipating income streams to make digital projects happen. Can any institution -- library, archives, historical society, or museum --afford to squander this investment? Without serious effort to ensure long-term access to today's digital image files, however, the risk of loss is tremendous.

Preservation is not just for the world of paper. We know that digital imaging technology, in and of itself, provides no easy answers to the preservation question. Indeed, simply defining what preservation means in the digital imaging environment is a challenge. Responding to the insight that such a definition might provide is harder still. The digital world poses significant challenges to, but does not eliminate the need for, responsible, effective preservation activity (Waters & Garrett, 1996).

Advantages of Digital Access

Digital imaging technology offers distinctive advantages to institutions with impressive collections of scholarly resources. Information content can be delivered directly to the reader without human intervention. Information content in digital form can be retrieved by readers remotely, although such delivery may tax the capabilities of even the most sophisticated projection equipment and networks. Digital image quality is extraordinary and is improving constantly. It is now possible to represent almost any type of traditional research material with such visual quality that reference to the original materials is unnecessary for most, if not all, purposes. The power of full-text searching and sophisticated, cross-collection indexing affords readers the opportunity to make new uses of traditional research resources. Newly developed system interfaces (the look and feel of the computer screen) combined

with new ways to deliver manageable portions of large image data files promise to revolutionize the ways in which research materials are used for teaching and learning. It is no wonder that there is a nearly overwhelming rush to jump on the digital bandwagon.

Risks of Digital Imaging Projects

Pressures from all fronts to digitize traditional research materials carry distinctive risks. The required investment for digital image conversion is tremendous -- possibly dollars for each and every page or frame converted. Digital imaging technologies require tremendous capital investment for underlying support systems in an environment of flat or marginally increasing budgets. Digital image conversion, in an operational environment, requires a deep and longstanding institutional commitment to traditional preservation, the full integration of the technology into information management procedures and processes, and significant leadership in developing appropriate definitions and standards for digital preservation.

The risk of loss is high -- far higher than in most other programs and activities carried out in a cultural institution. The nearly constant swirl of product development that fuels our perceptions of change raises the stakes higher still. When a library, archives, historical society, museum, or any other cultural organization with a preservation mandate stops experimenting with digital technology and decides to use it to improve services or transform operations, that institution has embarked down the preservation path.

What Digital Imaging Is Not

In the past few years, significant progress has been made to define the terms and outline a research agenda for preserving digital information that was either "born digital" or transformed to digital from traditional sources. "Digital preservation refers to the various methods of keeping digital materials alive into the future," according to a recent statement from the Council on Library and Information Resources (Waters, 1998). Digital preservation typically centers on the choice of interim storage media, the life expectancy of a digital imaging system, and the expectation to migrate the digital files to future systems while maintaining both the full functionality and the integrity of the original digital system. PBS recently aired the film *Into the Future*, which graphically portrayed the problem of digital information and speculated widely on the consequences of inaction, all the while offering precious few ideas of what to do about the dilemma.

It may be premature for most of us to worry about preserving digital objects until we have figured out how to make digital products that are worth preserving. Digital imaging technologies create an entirely new form of information from traditional

documents. Digital imaging technology is not simply another reformatting option in the preservation tool kit. Digital imaging involves transforming the very concept of format, not simply creating a faithful reproduction of a book, document, photograph, or map on a different medium. The power of digital enhancement, the possibilities for structured indexes, and the mathematics of compression and communication together fundamentally alter the concept of preservation in the digital world. These transformations, along with the new possibilities they place on information professionals, force us to transform library and archival services and programs in turn.

Preservation in the Digital World

The essence of traditional preservation management is resource allocation. People, money, and materials must be acquired, organized, and put to work to prevent deterioration or renew the usability of selected groups of materials. Preservation largely is concerned with the evidence embedded in a nearly endless variety of forms and formats. Things are preserved so that they can be used for all kinds of purposes, scholarly and otherwise.

People with the responsibility to do so have determined that some small portion of the vast sea of information, structured as collections of documents, books, collections, and other things, has research value as evidence well beyond the time and way intended by those who created or published it (Buckland, 1991). This distinction between the value of the information content (usually text and illustration) and the value of the evidence embedded in the artifact is at the heart of a decision-making process that is itself central to the effective management of both traditional and digital library materials.

In the digital world, preservation is the creation of digital products worth maintaining over time.

Each of these words carries weight.

- IS. Preservation is a reality and not merely a metaphor for or symbol of access.
- CREATION. The time to be concerned about the long-term persistence of digital products is when a system is designed and before digital conversion has begun.
- PRODUCTS. A digital product has its own identity and exists within a market economy. It is not necessary to sell or license a digital product for the product to have an identity within a community of end-users.
- WORTH. The work to design and create a digital product adds value to the information contained in the documents that serve as sources. The value added to a digital product must ultimately result in a product that is an essential and vital capital resource to the institution that has chosen to create it in the first place.

- MAINTAINING. The persistence of digital products requires careful attention to the maintenance of content (the bits and bytes) functionality (how the bits work in a system).
- OVER TIME. Preservation in the digital world is not absolute, but depends instead on the continuing transformative impact of the digital product on the information work of end-users.

It is impossible to come to terms with the responsibilities inherent in creating digital products without distinguishing between acquiring digital imaging technologies to solve a particular problem and adopting them as an information management strategy. Acquiring an imaging system to enhance access to library and archives materials is as simple as choosing the combination of off-the-shelf scanners, computers, and monitors that meets immediate functional specifications. Hundreds of cultural organizations already have invested in or are planning to purchase digital image conversion systems and experiment with their capabilities. Innumerable pilot projects have shown how much more challenging it is to digitize scholarly resources than the modern office correspondence and case files that drove the technology two decades ago. In time, most of these small-scale, pilot projects will fade away quietly -- and the initial investment will be lost -- as the costs of maintaining these systems become apparent, as vendors go out of business, and as patrons become more accustomed to remote-access image databases and the latest bells and whistles.

Administrators who have responsibility for selecting systems for converting materials with long-term value also bear responsibility for preserving their investment in the product. This commitment is a continuing one -- decisions about preservation cannot be deferred in the hope that technological solutions will emerge like a medieval knight in shining armor. An appraisal of the present value of a book, a manuscript collection, or a series of photographs in its original format is the necessary point of departure for making a judgment about preservation of the digital image version. The mere potential of increased access to a digitized collection does not add value to an underutilized collection. Similarly, the powerful capabilities of a relational index cannot compensate for a collection of documents whose structure, relationships, and intellectual content are poorly understood. Random access is not a magic potion for effective collection management.

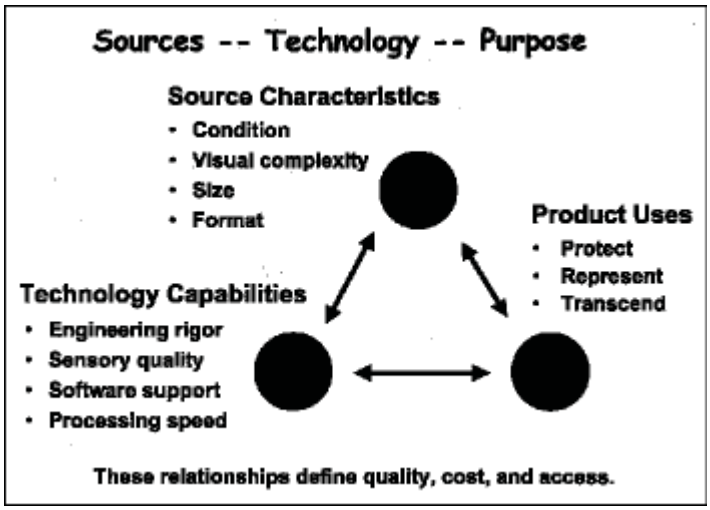
Relationships Among Purpose, Source, and Technology

The key to a successful conversion project or ongoing program lies in a thorough understanding of the relationships among three concepts. These concepts are (1) the characteristics of the source material being converted, (2) the capabilities of the technology used to accomplish the digital conversion, and (3) the purposes or uses to which the digital end product will be put. The figure that follows illustrates these relationships.

The Preservation Purposes of the Digital Product

It is possible to distinguish among three distinctive but not mutually exclusive preservation applications of digital technologies, defined in part by the possible purposes that the products may serve for end-users.

Protect Originals. The most common application of digital technologies in an archive or library is digital copies that can be used for ready reference in lieu of casual browsing through the original sources. Preservation goals are met because physical access to the original documents is limited. Examples include image reference files of photograph, clipping, or vertical files that permit the identification of individual items requiring closer study. The original order of the collection, or a book, may be frozen much like microfilm sets images in a linear array. This preservation use of the technology has become a compelling force motivating archives and libraries to experiment with hardware and software capabilities.



Represent Originals. A digital system could be built that represents the information content of the original sources in such detail that the system can be used to fulfill most, if not all, of the research and learning potential of the original documents. High-resolution systems that strive for comprehensive and complete content and seek to obtain full information capture, based on emerging standards and best practices, fit this definition. Systems of this intermediate level of quality open new avenues of research and use and could have a transformative effect on the service missions of those who create the products.

Transcend Originals. In a very small but increasing number of applications, digital imaging holds the promise of generating a product that can be used for purposes that are impossible to achieve with the original sources. This category includes imaging that uses special lighting to draw out details obscured by age, use, and environmental damage; imaging that makes use of specialized photographic intermediates; or imaging of such high resolution that the study of artifactual

characteristics is possible. This category also includes digital imaging products that incorporate searchable full text (marked up or raw). Additionally, digital products that draw together, organize, and enhance access to widely dispersed research materials may have transcendental impact on the people who use them.

Each of these preservation applications places separate but increasingly rigorous demands on digital technologies. In each case, the use of an intermediate film or paper copy to facilitate the scanning process may or may not be necessary or advisable. Finally, the disposition of original sources (including undertaking preservation treatments before or after conversion) is a matter quite separate from the decision to undertake digital conversion. Ultimately, the purpose of digital image products is determined by the uses to which they will be put, while preservation of original source documents must be determined by their specific preservation needs.

The Characteristics of Source Materials Being Converted

A major challenge in choosing paths from analog to digital is obtaining an in-depth understanding of the particular characteristics of the collections or the individual items being converted (Robinson, 1993). The most important characteristics are:

- Format of the source (including size of object, its structure, and its physical condition)
- Physical condition and its impact on the ability of the item to be handled during the conversion process
- Visual characteristics (including the centrality of text versus illustration)
- Color as an essential carrier of information content
- Level of detail (including the size and style of typefaces, the type of illustrative content, and the overall range of tonal values).

Beyond these specific characteristics, the degree of visual and physical similarity among the individual items in a given collection can have a significant impact on the cost, quality, and complexity of the conversion project.

The Capabilities of Scanning Technology

The third key to building a viable digital product is the measurement of the capabilities of the digital imaging hardware/software system in relation to the source documents and the purposes of the product. Digital conversion systems vary widely in capability and cost. Rigorous mechanical and electrical engineering plays a big role in the design and manufacture of specialized conversion tools. Many products are optimized for the conversion of a single type of document. All conversion tools have limitations in terms of the size of source documents they can handle with a given level of digital resolution. Although the adage, "You get what you pay for" typically applies in the acquisition of conversion hardware, there is no substitute for careful and thorough testing and benchmarking of conversion systems (Besser and Trant, 1995).

The expected uses of the product may drive the choice of technological applications, but the opposite is not necessarily true. It is important to recognize that standards and best practices that support digital product development should not be driven by the present limitations of digital image capture, display, and output. Matters such as the limited resolution of today's display screens and projection devices, the limited bandwidth of wide and local area networks, and the limitations of resolution and tone reproduction in printers should not determine the quality thresholds of image system design.

The relationships among source characteristics, technology capabilities, and the purposes of the end product bear upon the definitions of quality, cost, and access. In the area of quality, for example, an input source with particular characteristics, the limitations or costs of scanning technology at a given point, and the expected uses of the product interact to set the threshold requirements for image quality. Similarly, the expected purposes of the digital product and the characteristics of the source interact with imaging technology capabilities to determine the cost of creating the product with the intended purpose. The same is true for access, where the intellectual complexity of the source documents and the specification for the ways in which the image product will be used interact with the sophistication (or lack of it) of the hardware and software tools for building metadata files and other associated indexes.

Transformation of Preservation Principles

In the past two decades, a consensus has emerged within a community of practitioners about a set of fundamental principles that should govern the management of available resources in a mature preservation program. The principles of preservation in the digital world are the same as those of the analog world, and, in essence, define the priorities for extending the useful life of information resources. These concepts are longevity, choice, quality, integrity, and accessibility.

Preservation in the digital world is one of the central leadership issues of our day. It is the shared responsibility of many people in many institutions fulfilling many roles. An understanding of the impact of this role differentiation on digital preservation action is crucial. Role differentiation helps archivists and librarians -- acting as digital product developers -- know when to control their use of digital technologies, when they need to influence trends, and when they need to relinquish any expectation for either control or influence.

The Transformation of Longevity

The central concern in traditional preservation practice is the media upon which information is stored. The top priority is extending the life of paper, film, and magnetic tape by stabilizing their structures and limiting the ability of internal and

external factors to cause deterioration. The focus on external factors has led to specifications for proper environmental controls, care and handling guidelines, and disaster recovery procedures. Progress on efforts to control or mitigate the internal factors of deterioration has resulted in alkaline paper standards, archival quality microfilm, mass deacidification, and more rugged magnetic media. And yet, now that archivists and librarians have defined the issues surrounding the life expectancy of storage media, the very concept of permanence that has driven the search for "archival" media is fading as a meaningful intellectual construct for preservation (O'Toole, 1989).

Preservation in the digital context has little concern for the longevity of optical disks and newer, more fragile storage media. The viability of digital image files depends far more on the life expectancy of the access system -- a chain only as strong as its weakest component. Today's optical media most likely will far outlast the capability of systems to retrieve and interpret the data stored on them. Since it can never be known for certain when a system cannot be maintained or supported by a vendor, product developers must anticipate that valuable image data, indexes, and software will be migrated in their professional lifetimes to future generations of the technology.

Digital project managers can exercise a large measure of control over the longevity of digital image data through the careful selection, handling, and storage of rugged, well-tested storage media. They can influence the life expectancy of the information by making sure that local budgetary commitments are made consistently at an appropriate level. Ultimately, they have no control over the evolution of the imaging marketplace, especially corporate research and development activities that have a tremendous impact on the life expectancy of the digital systems created today.

The Transformation of Choice

Choice is selection. Preservation adds value through the process of selection. Choice involves defining value, recognizing it in something, and then deciding to address its preservation needs in the way most appropriate to that value. Over decades the act of preservation has evolved from saving material from oblivion and assembling it in secure buildings to more sophisticated assessing of condition and value on already-collected materials. Preservation selection has largely been driven by the need to stretch limited resources in as wise a fashion as possible, resulting in the dictum that "no item shall be preserved twice." The net result is a growing virtual special collection of items preserved with a variety of techniques, most notably by reformatting on microfilm. Selection is perhaps the most difficult of undertakings precisely because it is static and conceived by practitioners as either completely divorced from present use or completely driven by demand.

Selection in the digital world is not a choice made once and for all near the end of an item's life cycle, but rather is an ongoing process intimately connected to the active use of the digital files (Hazen, 1998). The value judgments applied when

making a decision to convert documents from paper or film to digital images are valid only within the context of the original system. It is a rare collection of digital files, indeed, that can justify the cost of a comprehensive migration strategy without factoring in the larger intellectual context of related digital files stored elsewhere and their combined uses for teaching and learning.

Even while recognizing that selection decisions cannot be made autonomously or in a vacuum, librarians and archivists can choose which books, articles, photographs, film, and other materials are converted from paper or film into digital image form. Influence over the continuing value of digital image files is largely vested in the right to decide when it is time to migrate image data to a future storage and access system and when a digital file has outlived its usefulness to the institution charged with preserving it. What digital product developers cannot control is the impact of their ongoing value judgments on the abilities of readers to find and use information in digital form. Unused digital products might as well not exist; they certainly will not survive for long as mere artifacts of the conversion process.

The Transformation of Quality

Digital product developers must reclaim image quality as the heart and soul of preservation.

Maximizing the quality of all work performed is such an important maxim in the preservation field that few people state this fundamental principle directly. Instead, the preservation literature dictates high quality outcomes by specifying standards for treatment options, reformatting processes, and preventive measures. The commitment to quality standards -- do it once, do it right -- permeates all preservation activity, including library binding standards, archival microfilm creation guidelines, conservation treatment procedures, the choice of supplies and materials, and a low tolerance for error. The evolution of preservation microfilming as a central strategy for the bulk of brittle library materials has placed the quality of the medium and the quality of the visual image on an equal plane. In the pursuit of quality microfilm, compromise on visual truth and archival stability is dictated largely by the characteristics of the item chosen for preservation.

Quality in the digital world, on the other hand, is conditioned significantly by the limitations of capture and display technology. Digital conversion places less emphasis on obtaining a faithful reproduction of the original in favor of finding the best representation of the original with a given technology. Mechanisms and techniques for judging the quality of digital reproductions are different and more sophisticated than those for assessing microfilm or photocopy reproductions (Kenney & Chapman, 1996). Additionally, the primary goal of preservation quality is to capture as much intellectual and visual content as is technically possible and then present that content to end-users in ways most appropriate to their needs.

The image market has subsumed the principle of maximum quality to the "solution" that finds the minimum level of quality acceptable to today's system users. Digital

product developers must reclaim image quality as the heart and soul of preservation. This means maximizing the amount of data captured in the digital scanning process, documenting image enhancement techniques, and specifying file compression routines that do not result in the loss of data during telecommunication. The control of digital quality standards is possible now, just as it is for microfilm. However, librarians and archivists can only influence the development of standards for data compression, communication, display, and output. Improvements in the technical capabilities of image conversion hardware and software are in the hands of the imaging industry.

The Transformation of Integrity

The concept of integrity has two dimensions in the traditional preservation context -- physical and intellectual -- both of which concern the nature of the evidence contained in the document. Physical integrity largely concerns the item as artifact. It plays out most directly in the conservation studio, where skilled bench staff use water-soluble glues, age-old hand-binding techniques, and high quality materials to protect historical evidence of use, past conservation treatments, and intended or unintended changes to the structure of the item. The preservation of intellectual integrity is based upon concern for evidence of a different sort. The authenticity, or truthfulness, of the information content of an item, maintained through documentation of both provenance -- the chain of ownership -- and treatment, where appropriate, is at the heart of intellectual integrity. Beyond the history of an item is concern for protecting and documenting the relationships among items in a collection. In traditional preservation practice, the concepts of quality and integrity reinforce each other.

In the digital world, maintaining the physical integrity of a digital image file has far less to do with the media than with the loss of information when a file is created originally, then compressed mathematically, stored in various formats, and sent across a network. In the domain of intellectual integrity, structural indexes and data descriptions traditionally published with an item as tables of contents or prepared as discrete finding aids or bibliographic records must be inextricably linked and preserved along with the digital image files themselves. Preserving intellectual integrity also involves authentication procedures, like audit trails, that make sure files are not altered intentionally or accidentally (Duranti, 1995). Ultimately, the digital world fundamentally transforms traditional preservation principles from guaranteeing the physical integrity of the object to specifying the creation of the object whose intellectual integrity is its primary characteristic.

Librarians and archivists can exercise control over the integrity of digital image files by authenticating access procedures and documenting successive modifications to a given digital record. They can also create and maintain structural indexes and bibliographic linkages within well-developed and well-understood database standards. Digital product developers also have a role to play in influencing the development of metadata interchange standards including the tools and techniques that will allow structured, documented, and standardized information about data

files and databases to be shared across platforms, systems, and international boundaries. It is vain to think, however, that librarians and archivists are anything but bystanders observing the rapid development of network protocols, bandwidth, or the data security techniques that are essential to the persistence of digital objects over time.

The Transformation of Access

In the fifty years that preservation has been emerging as a professional specialty in libraries and archives, the preservation and access responsibilities of an archive or library have often been in tension. "While preservation is a primary goal or responsibility, an equally compelling mandate -- access and use -- sets up a classic conflict that must be arbitrated by the custodians and caretakers of archival records," states a fundamental textbook in the field (Ritzenthaler, 1993). The intimate relationship between preservation and access has changed in ways that mirror the technological environment of cultural institutions.

Preservation OR Access. In the early years of modern archival agencies -- prior to World War II -- preservation simply meant collecting. The sheer act of pulling a collection of manuscripts from a barn, a basement, or a parking garage and placing it intact in a dry building with locks on the door fulfilled the fundamental preservation mandate of the institution. In this regard preservation and access are mutually exclusive activities. Use exposes a collection to risk of theft, damage, or misuse of either content or object. The safest way to ensure that a book lasts for a long time is to lock it up or make a copy for use.

Preservation AND Access. Modern preservation management strategies posit that preservation and access are mutually reinforcing ideas. Preservation action is taken on an item so that it may be used. In this view, creating a preservation copy on microfilm of a deteriorated book without making it possible to find the film is a waste of money. In the world of preservation AND access, however, it is theoretically possible to fulfill a preservation need without solving access problems. Conversely, access to scholarly materials can be guaranteed for a very long period, indeed, without taking any concrete preservation action on them.

Preservation IS Access. Librarians and archivists concerned about the preservation of electronic records sometimes view the two concepts as cause and effect. The act of preserving makes access possible. Equating preservation with access, however, implies that preservation is defined by availability, when indeed this construct may be getting it backwards. Preservation is no more access than access is preservation. Simply refocusing the preservation issue on access oversimplifies the preservation issues by suggesting that access is the engine of preservation without addressing the nature of the thing being preserved.

Preservation OF Access. In the digital world, preservation is the action and access is the thing -- the act of preserving access. A more accurate construct simply states "preserve accessibility." When transformed in this way, a whole new series of

complexities arises. Preserve access to what? The answer suggested in this chapter is: a high quality, high value, well-protected, and fully integrated digital product that is derived from but independent of original source documents. The content, structure, and integrity of the digital product assume center stage -- and the ability of a machine to transport and display this product becomes an assumed end result of the preservation action rather than its primary goal.

Control over accessibility, especially the capacity of the system to export digital image files (and associated indexes) to future generations of the technology, can be exercised in part through prudent purchases of only nonproprietary hardware and software components. In the present environment, true plug-and-play components are more widely available. The financial commitment by librarians and archivists is one of the only incentives that vendors have to adopt open system architectures or at least provide better documentation on the inner workings of their systems. Additionally, librarians and archivists can influence vendors and manufacturers to provide new equipment that is backward compatible with existing systems. This capability assists image file system migration in the same way that today's word processing software allows access to documents created with earlier versions. Much as they might wish otherwise, digital product developers have little or no control over the life expectancy of a given digital image system and the decision to abandon that system.

Conclusion

Fifty years ago, one of the foremost and persistent advocates for quality library bookbinding put his finger on the centrality of preservation to the mission of modern research libraries and archives. Preservation, wrote Pelham Barr in his most frequently cited work, "as responsible custody, is the only library function which should be continuously at work twenty-four hours a day. It is the only function which should be concerned with every piece of material in the library from the moment the selector becomes aware of its existence to the day it is discarded" (Barr, 1946). Barr's allusion to the lifecycle of information sources is timeless. Today the concept is at the center of information management theory and practice, including specifications for the disposition of government archives, the management of book collections, and the maintenance of large-scale information technology systems. Responsible custody circumscribes preservation in the digital world as well, where the creation of digital products worth maintaining over time is the measure of success. The idea of responsible custody should govern actions as we build digital products vested with the value of intellectual endeavors.

Summary of Key Principles and Points

- Define clear boundaries for a digital conversion project, particularly the end point.

- Brainstorm: In nontechnical terms, state the desired outcomes for the source materials and the functional requirements for the digital reproductions.
- Justify why digital, rather than analog, reproduction is necessary.
  -- Describe the audiences and their needs.
  -- Describe the things that digital copies will do that analog copies cannot.
- Project a lifespan for the digital reproductions.
- Plan: Write a project plan, budget, timeline, and other planning documents.
- Budget and plan workflow based upon the results of scanning and cataloging a representative sample of material.
- Budget (time, if not dollars) for training.
- Implement: Coordinate simultaneous or overlapping workflows.
- Segregate materials into batches for conversion and quality control.
- Write documentation during the project.
- Report on the lessons learned, particularly the failures and blind alleys: help yourself and your colleagues to learn from your mistakes.

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