

Spring 5-15-2009

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Running head: DIGITAL REPOSITORY ADOPTION

Digital Repository Adoption in New York City Research Institutions

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Abstract

As more scholarly and research materials are created in digital formats, institutions charged with managing, preserving, and disseminating these materials are increasingly adopting specialized software tools and environments created to fulfill these functions. Concurrently, subscriptions to serials databases provided by academic publishers are increasingly prohibitive and problematic. This paper surveys the adoption of digital institutional repositories by research institutions in the New York City region as of the Spring of 2009, and concludes that in spite of their potential advantages these systems are still not widely applied toward addressing the issues of preservation and access to their fullest potential.

Digital Repository Adoption in New York City Research Institutions

1. Introduction

Background

Over the past twenty years computer networks and personal computing devices have become both a commonplace and necessary part of the typical organizational environment. As a result, academic and institutional research is often natively produced and recorded in electronic formats, with printed copies and alternative methods of access provided as required (OCLC, 2003). The rise of these *born digital* documents is an issue affecting businesses and institutions of every type, and librarians, archivists, and records managers tasked with organizing and preserving these materials have invested considerable time and attention researching the issue (Arms & Fleischhauer, 2005, Garrett & Waters, 1996, Plocher, 1999).

Records Management professionals operate under legal and organizational mandates, often with precise requirements for the classification and retention of materials in any format. Although many issues specific to electronic documents are still being determined (King & Stanley, 1985), Records Officers attached to large enterprises frequently leverage the economic advantage of extending their requirements to company procurement policies, resulting in company-wide Electronic Records Management (ERM) systems such as those produced by EMC, IBM, and Open Text which include records series classification schema and software tools for automated ingestion and management of business content (Cox, 2000).

Many Archivists today are still primarily tasked with selecting, preserving, and describing collections of traditional physical materials. Archivists attached to corporate and government institutions are increasingly faced with managing electronic items that have no

physical counterpart, including not only documents and email correspondence but graphic art, recorded music, and audiovisual media (Falk, 2003). As with Records Management professionals, the trend is to rely on commercial tools operated and managed by their respective Information Technology departments. Archivists within the academic and cultural institutions, however, are more likely to participate in the development of systems specifically created and funded by their communities (Goodman, Forbes & Kaufman, 2007).

Librarians practice their profession in several specialized areas serving a variety of organizational establishments. The introduction of digital media has impacted all librarians to varying degrees, ranging from the gradual adoption of electronic books and readers in public libraries to the rapid growth of online journal publishing in the academic and research environments (Housewright & Schonfeld, 2008). This latter development in particular has resulted in great costs and opportunities that are just beginning to be explored.

Problem

Since their beginnings as printing houses attached to institutions of higher learning, academic publishers have served as the gatekeepers of scholarly research. Working with experts in their fields, publishers offered peer-reviewed, refereed collections that enhanced the prestige of the publication, the participants, and their associated academies, and helped ensure the reliability of their contents. Over time subscription costs of these journals have become increasingly expensive, often due to the unique nature of a particular title considered valuable by researchers along with the growth in consolidation of titles managed by a small number of commercial publishers (Kim, Markey, Rieh, St. John & Yakel, 2007).

With the rapid growth of the Internet and concurrent advances in the communication and

networking technologies supported, publishers began offering access to their content through online subscriptions. This trend promised increased access but left subscribers without tangible work to include in their collections. Coupled with the movement to cease printing physical copies of all but the most prestigious journals, academic and research libraries found themselves without permanent rights to the materials their constituents required in the course of fulfilling their professional obligations. The facility publishers gained through the automated management and distribution of electronic document collections did not result in a corresponding decrease in costs for libraries, often leading to reduced purchasing, canceled subscriptions, or the formation of cooperative consortia for the purpose of sharing expenses, similar to interlibrary loan agreements (Coombs, 2005).

One response to this “serials crisis” is *Open Access Publishing*, a movement toward providing free online access to scholarly materials. In many cases the research may be partially or largely funded by government grants, under the condition that it be eventually made available to the public free of charge. Other journals require the author to pay for publication, typically funded through an institution or stipulated within a research grant (Moghaddam, 2008). Another approach, although not exclusively used for providing access, is the creation of an Institutional Repository through self-archiving.

Repositories traditionally refer to storage facilities, and the precise terminology adopted for describing the virtual counterpart of this edifice is still evolving. The term “Digital Repository” is used interchangeably with “Digital Library” and refers to information retrieval systems that provide materials that can be exclusively in electronic formats or as digitized surrogates of physical originals. An Institutional Repository is traditionally an Archive used for

storing and preserving printed documents, but the designation is increasingly applied to exclusively digital collections (Bailey, Coombs, Emery, Mitchell, Morris, Simons & Wright, 2006). For clarity I refer to these systems as Digital Institutional Repositories, and focus primarily on examples designed around the requirements of born-digital materials. Although frequently associated with providing alternative distribution methods to subscription-base academic publishing, these resources are also used to house materials that have been submitted for publication in traditional research journals.

Purpose

Although lists of digital institutional repositories exist, this study will concentrate on research and academic libraries in the city of New York as of April, 2009. After identifying institutions that meet these criteria the survey will be directed to the library officer with responsibilities most likely to coincide with managing repositories and/or digital materials.

In conducting the survey five questions will be addressed:

1. What is the mission of the organization, and what type of research materials are typically produced there?
2. Does the library host a repository or collection of these materials, and if so does this include digital content in its original form?
3. If the library does not preserve and manage the electronic documents produced by their institution do they intend to, and are there plans to implement a specific software platform for this purpose?
4. What is the role of the library in operating and managing these current or potential systems?

5. Will the responsibility fall largely upon their Information Technology (IT) departments, be divided between the library and IT, or managed entirely by dedicated library staff?

This survey is intended to provide a better understanding of the current landscape of repository adoption in the New York City region, and to test several impressions suggested by existing literature on the subject.

A distinguishing characteristic of software commonly used in repository systems is that it is often developed within the academic community, and released using Free and Open Source Software licenses allowing wide and unrestricted distribution (McHugh, 2005). Yet in spite of this collaborative and inexpensive circumstance, only a relatively small selection of research libraries had these resources at their disposal. Early adopters are typically institutions specializing in applied science and mathematics, suggesting a relationship between these disciplines and the demand for content management technologies (van Horik, Mossink, Proudman, Sierman & Swan, 2008). In the process of considering these issues the survey seeks to provide a “snapshot” of digital content production and management, using a specific area and point in time.

2. Literature Review

Before approaching an analysis of the digital repository landscape it is useful to understand not only the history of repository adoption but also the circumstances affecting information professionals that influenced these events. As far back as the late 1960's the Xerox Corporation promised increased improvements in document automation leading to what they referred to as "the paperless office," but it was only with the advent of the personal computer twenty years later that production of electronic materials began to noticeably influence information management decisions. Researching this evolution requires examining its impact upon the branches of Library and Information Science individually.

Digital Libraries

Libraries of every type, from public to academic to business-oriented, were early adopters of automated systems. The need to increase efficiency and avoid duplication of effort lead to the creation of computerized systems for representing the bibliographic standards already in existence, in the form of Machine Readable Catalog (MARC) records by the Library of Congress along with protocols for exchanging this data over electronic networks.

With the increase in electronic bibliographic records came the development of the Online Public Access Catalog (OPAC) and Integrated Library System (ILS). Librarians also became responsible for cataloging and managing materials beyond traditional printed books and monographs, including new media types like CDROM and DVD, new binary formats for audiovisual and multimedia content, and collections that exist only within electronic databases. The history of digital repositories begins with the library, and listed below are several articles I consulted for a greater understanding of the origins and subsequent impact of these

developments.

Coyle, K. (2005). Libraries and standards. *The Journal of Academic Librarianship*, 31(3), 373-376.

Librarian Karen Coyle examines the history and nature of libraries, with an emphasis on the bibliographic and electronic standards that have both aided their development and enhanced their utility for patrons and researchers.

Sreekumar, M. G., & Sunitha, T. (2005). Seamless aggregation and integration of diverse datastreams: Essential strategies for building practical digital libraries and electronic information systems. *The International Information & Library Review*, 37, 383-393.

A case study in the creation of a digital library for an Indian Research Institute, this paper describes how traditional materials, new formats, and external sources are collectively integrated into a unified structure using the Greenstone system. For academic and research libraries an institutional repository is often an additional required element of their organizational mandate.

OCLC (2003). *OCLC Library & Information Center five-year information format trends*.

Retrieved March 2, 2007, from <http://www.oclc.org/reports/2003format.htm>

The Online Computer Library Center of Dublin Ohio has been a leading institution in the adoption of electronic standards and applications within the library world, with their WorldCat online union catalog, the Dublin Core standard for general descriptive metadata, and participation in the conversion of traditional MARC records into an Extensible Markup Language (XML) format as prominent examples. This report describes the adoption of nontraditional electronic formats in the library and publishing world as of 2003, and suggests trends that library and information professionals should consider over the next five years.

Wusteman, J. (2003). XML and e-journals: The state of play. *Library High Tech*, 21(1), 21-34.

On a related note, Judith Wusteman describes initiatives within the commercial and academic publishing world to adopt an XML “workflow” system for the creation and management of their content. These typically involve internally developed systems built without reference to common standards, resulting in incompatible implementations of common features such as search indexes and authority controls.

Coombs, K. A. (2005). Lessons learned from analyzing library database usage data. *Library Hi Tech*, 23(4), 598-609.

Karen Coombs describes a project carried out in the State University of New York for tracking journal database subscription usage, independent of publisher-supplied metrics. The influence of library instruction is examined, along with a description of the typical consortium subscription model.

Housewright, R., & Schonfeld, R. (2008). *Ithaka's 2006 Studies of Key Stakeholders in the Digital Transformation in Higher Education*. Ithaka. New York: Ithaka. Retrieved February 18, 2009, from <http://www.ithaka.org/research/Ithakas%202006%20Studies%20of%20Key%20Stakeholders%20in%20the%20Digital%20Transformation%20in%20Higher%20Education.pdf>

Housewright and Schonfeld provide an analysis of a 2006 survey of academic librarians and faculty regarding the use of electronic resources at their institutions and the changing relationship between researchers and the library. They conclude that a strategic and evolutionary change is required within all components of the academic environment, to ensure continued relevance and quality services satisfying information needs in a rapidly shifting landscape.

Roper, J. O., & Wisser, K.M. (2003). Maximizing metadata: Exploring the EAD-MARC relationship. *Library Resources & Technical Services*, 47(2), 71-76.

The intersection of digital libraries and archives is illustrated through a case study of the North Carolina State University Libraries. Collection Finding Aids created in Encoded Archival Description XML were transformed into MARC XML bibliographic records, resulting in automated integration within the Libraries OPAC and further demonstrating the value of formats and protocols built around open standards.

Records Management Systems

Records Managers are among the first information professionals to deal with native digital objects, usually in the form of spreadsheets, email messages, and word processor correspondence created by the organizations they serve. These include government agencies and offices, which have legislative guidelines and mandates for handling the Records Series (classification schemata for work-related documents) and Retention Schedules necessary for ensuring the successful fulfillment of their mission. A typical Series includes the *Archival* stage, in which management of records considered of permanent value is transferred to a repository environment. Records programs exist in many corporate environments for similar reasons, and contribute to the seamless operation of a business.

Lamont, J. (2007). All roads lead to RM. *KM World*, 6, 12-14.

In this article Judith Lamont provides a general overview of Records Management, and makes the case for instituting a sound RM program in response to the need for greater accountability and compliance with legal oversight.

Plocher, D. (1999). The digital age: Challenges for records management. *Government*

Information Quarterly, 16(1), 63-69.

Writing in 1999, David Plocher issued a stern warning about the consequences of failing to institute policies for handling digital records as their volume increased dramatically.

King, R., & Stanley, C. (1985). Ensuring the court admissibility of computer-generated records.

ACM Transactions on Office Information Systems, 3(4), 398-412.

Simply storing and indexing electronic records is not always sufficient for supporting their evidential value in a court of law. Roger King and Carolyn Stanley provide an overview of an informal method for optimizing the value of digital materials in the face of legal challenges.

Duranti, L. (2001). Concepts, principles, and methods for the management of electronic records.

The Information Society, 17(4), 271-279.

The issue of authenticity is fundamental to Archival practice, yet difficult to ascertain when examining electronic records. Researcher Luciana Duranti describes her work in establishing systems for measuring trustworthiness in an environment that facilitates perfect duplication and trivial modification.

Cunningham, A., & Robertson, A. (2000). Documenting the business of government: Archival

issues in the digital age. *Australian Academic & Research Libraries*, 31(4), 187-201.

Digital record-keeping was adopted by the provincial governments of Australia a decade ago, resulting in numerous studies on the effectiveness of various policies and systems. This article provides an historical overview of these initiatives and their evolution.

Boadle, D. (2004). Reinventing the archive in a virtual environment: Australians and the non-

custodial management of electronic records. *Australian Academic & Research Libraries*, 35(3), 242-252.

Following the Australian practices for electronic records management, Don Boadle offers a critique of the decision to distribute authority control among several agencies instead of a centralized Archive.

Kelly, B., & Pennock, M. (2006). Archiving web site resources: A records management view. *Proceedings of the 15th international conference on World Wide Web*, 987-988.

A unique issue for Records Managers is the concept of dealing with web documents intended for online consumption. In this presentation the techniques of records management are applied to the content of a web site, and the resulting challenges and uncertainties are enumerated.

Hoe, N. S. (2006). *Free/Open source software: Open standards*. UNDP-ADIP IOSN. New Delhi, India: Elsevier. Retrieved March 10, 2007, from <http://www.iosn.net/open-standards/foss-open-standards-primer/foss-openstds-withcover.pdf>

No discussion of digital records is complete without considering the maze of vendor-specific formats and systems complicating the process. To assist developing nations in maximizing the value of their digital infrastructures the United Nations created this introductory document describing the options and tools available for working with materials based on open and freely available standards.

Archives

The ultimate goal of a digital institutional repository system is to apply the principles of archival science to the new frontier of digital and digitized objects. These principles include *Selection, Preservation, and Access*. Because of the nature of digital technology, concepts such as *provenance* (establishing origin and a clear chain of custody) and the related idea of authenticity

are unavoidably difficult in a virtual environment, and must be largely managed by organizational policy. Literature on the topic is wide-ranging and expansive, appearing in many different sources and publications and incorporating varied perspectives.

Cox, R. J. & O'Toole, J.M. (2006). *Understanding Archives & Manuscripts*. Chicago, IL: The Society of American Archivists.

No discussion of digital archiving can begin without an understanding of the practice of Archives. Although the institution has existed in varying forms throughout history, formal definitions of the profession developed primarily in the twentieth century and this text provides an overview of the archival landscape as it stands today.

van Albada, J. (2006). Archives: Particles of memory or more?. In F. X. Blouin & W. G. Rosenberg (Eds.), *Archives, Documentation & Institutions of Social Memory*. New York: Oxford University Press. pp. 215-218.

Despite the establishment of a more codified archival profession, Joan van Albada provides a meditation on the fluid understanding and nature of archives still extant, particularly as the institution crosses cultural and international boundaries.

Cox, R. J. (2000). Searching for authority: Archivists and electronic records in the new world at the fin-de-siècle. *First Monday*, 5(1). Retrieved November 10, 2007 from http://firstmonday.org/issues/issue5_1/cox/index.html

Jimerson, R. C. (2004). The future of archives and manuscripts. *OCLC Systems & Services: International Digital Library Perspectives*, 20(1), 11-14.

Michalko, J. (2007). Libraries, archives, and museums: Achieving scale and relevance in the digital age. *RBM: A Journal of Rare Books, Manuscripts, and Cultural Heritage*, 8(1),

75-79.

The articles listed above express the shared conversation among traditional archivists regarding the increasingly digital world. A common thread is the need for increased collaboration outside of the profession, and the real possibility of an eventual division between practitioners specializing in “analog” and digital archiving.

Digital Preservation

Due to the intangible nature of digital materials and media, many traditional archivists consider Digital Preservation a contradiction in terms: An insufficient amount of time has passed to define the effectiveness of existing preservation initiatives, and the market-driven motives of the technology industry rarely reflect the interests of conservationists, favoring a steady stream of upgrades and planned obsolescence instead. As a result of these circumstances, preservation continues to be a frequent topic of discussion and research in archival literature.

Kuny, T. (1998). A digital dark ages? Challenges in the preservation of electronic information.

International Preservation News, 17, 1-12.

Among the earliest articles drawing attention to the need for digital preservation, Terry Kuny postulated that failure to adopt appropriate conservation measures would result in a lost period of recorded human history.

Garrett, J., & Waters, D. (1996). Preserving digital information: Report of the Task Force on

Archiving of Digital Information. Research Library Group. Washington, DC: Council on Library and Information Resources. Retrieved December 1, 2007, from

<http://www.oclc.org/programs/ourwork/past/digpresstudy/final-report.pdf>

One of the earliest responses to the issue of digital preservation was the formation of a

task force composed of members of the Research Libraries Group and the Commission on Preservation and Access.

Rothenberg, J. (1999). *Avoiding technological quicksand: Finding a viable technical foundation for digital preservation*. Commission on Preservation and Access. Washington, DC: Council on Library and Information Resources. Retrieved November 10, 2007, from <http://www.clir.org/pubs/reports/>

A resulting analysis of the task force's work was this study, in which Jeff Rothenberg concludes that creating systems for emulating existing software environments and applications could be the best approach toward ensuring materials stored in these formats will remain accessible.

Hodge, G. M. (2000). Best practices for digital archiving: An information life cycle approach. *D-Lib Magazine*, 6(1). Retrieved November 10, 2007 from <http://www.dlib.org/dlib/january00/01hodge.html>

Gail Hodge provides a good overview of the practical differences between physical and digital preservation, urging archivists and librarians to become actively involved in the dialog between manufacturers and developers before the potential for lost information becomes irreversible.

Kahle, B., & Lyman, P. (1998). Archiving digital cultural artifacts: Organizing an agenda for action. *D-Lib Magazine*, 4. Retrieved November 10, 2007 from <http://dlib.org/dlib/july98/07lyman.html>

Lyman, P. (2002). *Archiving the World Wide Web*. University of California, Berkeley. Washington, DC: Council on Library and Information Resources. Retrieved November

10, 2007, from <http://www.clir.org/pubs/reports/pub106/web.html>

Edwards, E. (2004). Ephemeral to enduring: The Internet Archive and its role in preserving digital media. *Information Technology & Libraries*, 3, 3-8.

McClure, M. (2006). Archive-It 2: Internet Archive strives to ensure preservation and accessibility. *EContent*, 29(8), 14-15.

Parallel to investigations in electronic document preservation were initiatives to manage the rapidly growing resource of Internet web content. Brewster Kahle, a successful technology entrepreneur in the field of online metrics, created the Internet Archive as a means of storing previous iterations of publicly available websites through his “wayback machine.” The above articles describe his efforts, their successes and failures.

Arms, C., & Fleischhauer, C. (2005). *Digital formats: Factors for sustainability, functionality, and quality*. Paper Presented at the IS&T Archiving Conference, Washington, DC.

Retrieved February 25, 2007, from http://memory.loc.gov/ammem/techdocs/digform/Formats_IST05_paper.pdf

Spurred on by the need for authoritative guidance, the Library of Congress began an exhaustive study of the file formats produced by software applications. In the process it became apparent that digital materials existed in various stages, depending upon the requirements of the creator, and storage formats reflected these needs. Unlike the perfect versions of published materials submitted to the Library, the study determined that intermediary stage formats may be necessary for continuous accessibility.

McHugh, A. (2005). Open source for digital curation. In M. Day, & S. Ross (Eds.), *DCC Digital curation manual*. Retrieved March 9, 2007, from <http://www.dcc.ac.uk/resource/curation->

[manual/chapters/open-source/opensource.pdf](#)

Digital preservation is best served when the materials are available in formats based on open standards, and the software-based tools and platforms built using open source methods have proven themselves the best options for working with these objects. This manual provides guidance for institutions wishing to adopt these tools as part of their preservation initiatives.

Dell'oro, J., Hills, B., Waugh, A., & Wilkinson, R. (2000). Preserving digital information forever. *Proceedings of the Fifth ACM Conference on Digital Libraries*, 175-184.

van Diessen, R. J., Oltmans, E., & van Wijngaarden, H. (2004). Preservation functionality in a digital archive. *Proceedings of the fourth ACM/IEEE-CS Joint Conference on Digital Libraries*, 279-286.

Burke, G. B., Kwon, H., & Pardo, T.A. (2006). Building a state government digital preservation community: Lessons on interorganizational collaboration. *Proceedings of the 2006 international conference on Digital Government Research*, 277-284.

These reports describe preservation activities incorporated into repository systems in Australia, the Netherlands, and the United States. Various approaches, including the Victorian Electronic Record Strategy, the Open Archiving Initiative reference model, and collaborative development of customized interdepartmental requirements, are discussed.

Ludäscher, B., Marciano, R., & Moore, R. (2001). Preservation of digital data with self-validating, self-instantiating knowledge-based archives. *ACM SIGMOD Record*, 30(3), 54-63.

Coles, S., & Patel, M. (2007). *A study of curation and preservation issues in the eCrystals data repository and proposed federation*. University of Bath. Bath, UK: JISC eBank-UK

Project. Retrieved November 24, 2007, from [http://www.ukoln.ac.uk/projects/ebank-uk/curation/eBank3-WP4-Report%20\(Revised\).pdf](http://www.ukoln.ac.uk/projects/ebank-uk/curation/eBank3-WP4-Report%20(Revised).pdf)

As the adoption of digital repositories increased, these case studies describing the practical implementation of preservation affordances share knowledge of potential pitfalls and best practices.

Digitization

No discussion of institutional repositories is complete without considering digitization programs. Created primarily as a means of increasing access to physical materials, digital surrogates are typically managed through a repository system and often assist preservation by reducing the need for direct contact with original collection items.

Gray, C. (1999). Digital vector data and heritage applications: Development, usage, and current status. *APT Bulletin*, 30(2/3), 33-36.

Huang, T., Liu, J., & Tseng, M. (2004). Mediating team work for digital heritage archiving. *Proceedings of the fourth ACM/IEEE-CS Joint Conference on Digital Libraries*, 259-268.

Goodman, C., Forbes, M., & Kaufman, S. (2007). *OpenCollection web-based collection cataloguing and access software*. Paper presented at the Museums and the Web 2007 Conference. Retrieved November 21, 2008, from <http://www.archimuse.com/mw2007/papers/goodman/goodman.html>

These articles describe recent initiatives in digital archiving through digitization, and illustrate how in many cases the electronic proxy may be the only means of access for fragile and impermanent artifacts.

Bescós, J., Gladney, H. M., Mintzer, F., Schiattarella, F., & Treu, M. (1998). Digital access to

antiquities. *Communications of the ACM*, 41(4), 49-57.

Besek, J. M. (2003). *Copyright issues relevant to the creation of a digital archive: A preliminary assessment*. Library of Congress. Washington, DC: Council on Library and Information Resources. Retrieved November 10, 2007, from <http://www.clir.org/pubs/reports/pub135/contents.html>

Digitization presents its own set of unique challenges, including issues of privacy and ownership not present in native digital objects. These papers enumerate potential issues arising from digitization projects that are not immediately obvious to technology professionals.

Nichols, S. G. (2006). An artifact by any other name: Digital surrogates of medieval manuscripts. In F. X. Blouin & W. G. Rosenberg (Eds.), *Archives, Documentation & Institutions of Social Memory*. New York: Oxford University Press. pp. 134-143.

Hafner, K. (2007, March 11). History, digitized (and abridged). *The New York Times*, p. C1.

When viewed from external perspectives, digitization projects can present unseen benefits, such as the increased clarity of scanned medieval documents discussed by Stephen Nichols, but simultaneously create the mistaken impression of comprehensiveness described by Katie Hafner.

Digital Repositories in Practice

In the decade after the digital archiving conversation began, numerous institutions began implementing systems with varying degrees of success. From pre-publication research articles to student Electronic Thesis and Dissertation systems, the following articles describe the state of digital institutional repositories from the beginning of the 21st Century to the present.

Falk, H. (2003). Digital archive developments. *The Electronic Library*, 21(4), 325-359.

Anuradha, K. T. (2005). Design and development of institutional repositories: A case study.

International Information & Library Review, 37(3), 169-178.

Hunter, I. (2006). Digital archives. *PNLA Quarterly*, 70(2), 7-9.

Besser, H. (2007). Collaboration for electronic preservation. *Library Trends*, 56(1), 216-229.

Practitioners in the field of digital archiving discuss their experiences and share observations in the above articles, including the value of multidisciplinary collaboration, legal hurdles, technical impediments, and economic advantages.

Andersson, S., Hansson, P., Klosa, U., Müller, E., & Siira, E. (2003). *Using XML for long-term preservation: Experiences from the DiVA Project*. Paper Presented at the Sixth

International Symposium on Electronic Theses and Dissertations, Berlin, Germany.

Retrieved March 2, 2007, from <http://edoc.hu-berlin.de/conferences/etd2003/hansson-peter/PDF/>

Andersson, S., Hansson, P., Klosa, U., & Müller, E. (2003). *Archiving workflow between a local repository and the national archive: Experiences from the DiVA Project*. Paper presented

at the ECDL Conference, Trondheim, Norway. Retrieved November 21, 2008, from

http://epc.uu.se/files/archiving_ECDL_2003.pdf

Chang, H., Chen, H., & Yu, S. (2005). Building an open archive union catalog for digital archives. *The Electronic Library*, 23(4), 410-418.

Byrd, S., Henry, G., Spiro, L., & Wise, M. (2007). Expanding roles for the institutional repository. *OCLC Systems & Services*, 23(2), 216-223.

Caplan, P. (2007). The Florida Digital Archive and DAITSS: A working preservation repository based on format migration. *International Journal on Digital Libraries*, 6, 305-311.

Devakos, R., & Toth-Waddell, A. (2008). Ontario government documents repository D-Space pilot project. *OCLC Systems & Services*, 24(1), 40-47.

The case studies listed above provide an overview of various archiving initiatives, including academic libraries participating in national repository programs and government agencies migrating public documents for greater accessibility.

Moore, R. W., & Smith, M. (2007). Digital archives policies and trusted digital repositories. *The International Journal of Digital Curation*, 2(1), 92-101.

With the successful implementation of repository systems, new features can be added to enhance their value and represent organizational policies. Reagan Moore and MacKenzie Smith describe a multi-institutional project to automatically determine the “trustworthiness” of an installation’s preservation functionality.

Sun Microsystems (2008). *Case study: Digital preservation at the national library of New Zealand*. Retrieved December 1, 2008, from <http://www.natlib.gov.nz/Sun-Case-Study-May-2008.pdf>

This vendor-supplied case study illustrates how manufacturers began recognizing the special requirements of librarians and archivists, and created systems customized to meet these needs in a collaborative fashion.

Bailey, Charles W., Jr., Coombs, K., Emery, J., Mitchell, A., Morris, C., Simons, S., & Wright, R. (2006). *Institutional Repositories*. University of Houston Libraries. Washington, DC: Association of Research Libraries. Retrieved April 3, 2009, from <http://www.arl.org/bm~doc/spec292web.pdf>

Kim, J., Markey, K., Rieh, S. Y., St. Jean, B., & Yakel, E. (2007). Census of institutional

repositories in the United States: MIRACLE project research findings. Council on Library and Information Resources. Ann Arbor, MI: Institute of Museum and Library Services. Retrieved March 6, 2009, from <http://www.clir.org/pubs/reports/pub140/contents.html>

van Horik, R., Mossink, W., Proudman, V., Sierman, B. & Swan, A. (2008). *A DRIVER's guide to European repositories*. Amsterdam: Amsterdam University Press.

Moghaddam, G. G. (2008). Preserving scientific electronic journals: A study of archiving initiatives. *The Electronic Library*, 26(1), 83-96.

As digital repository systems are progressively adopted, surveys are increasingly conducted to ascertain the nature of these installations, their management and use. These reports are the direct source of inspiration for my investigation, and provide direction and focus in determining the problems and issues relevant to my analysis.

3. Survey Methodology

To ascertain if adoption of digital institutional repositories has increased over the last decade it was determined that a survey would be the best instrument of measurement. This conclusion is reflected in the literature on the subject, in which institutions in a position to implement these repository systems are regarded as the independent variables, and the subsequent adoption or intent to adopt a repository becomes the dependent variable. Due to the limitations of time and resources it was necessary to restrict the survey to a constrained geographic area, in this case the City of New York, which has a large and varied concentration of research-producing organizations suitable for inclusion. Determining if these organizations are adequately representative of the larger population of research institutions is unavoidably beyond the scope of this study.

The criteria for selecting survey participants centered around three points: The organization must produce or sponsor original research and related materials in electronic format; the organization must have a library responsible for managing and disseminating these materials; and the organization and its library must have an established physical presence, either primary or secondary, within the political boundaries of the City of New York. To identify which institutions fit these criteria, extensive initial research was conducted using the Internet and printed directories. Sources included the Association of Research Libraries, the American Library Association, and the OCLC Research Libraries Group. The result was a collection of forty-two libraries, listed below:

Bank Street College of Education Library

Bard Graduate Center Research Library

Baruch College Newman Library

Brooklyn College Library

Brooklyn Law School Library

City College of New York Cohen Library

City University of New York Libraries

College of Staten Island Library

Columbia University Libraries

Cooper Union Library

CUNY Graduate School of Journalism Research Center

CUNY School of Law Library

Fashion Institute of Technology Digital Image Library

Fordham University Libraries

The Graduate Center Mina Rees Library

Hunter College Wexler Library

John Jay College of Criminal Justice Sealy Library

Lehman College Lief Library

The Leo Baeck Institute

Long Island University Brooklyn Campus Library

Manhattan College Mary Alice and Tom O'Malley Library

The Metropolitan Museum of Art Thomas J. Watson Library

The New School University Libraries

New York City College of Technology Schwerin Library

The New-York Historical Society

New York Institute of Technology Library

New York Law School Mendik Law Library

New York Public Library Digital Library Program

New York University Libraries

Pace University Library

The Population Council

Pratt Institute Library

Queens College Rosenthal Library

Queensborough Community College Kurt R. Schmeller Library

The Rockefeller University Library

St. John's University Library

Touro College Library Technical and Electronic Services

Wagner College Hormann Library

Weill Cornell Medical College Medical Library

Yeshiva University Libraries

YIVO Institute for Jewish Research Library

York College Library

Upon identifying suitable candidate institutions, the next task required determining the ideal officer representing the organization's digital research initiatives to serve as a respondent.

Where possible, the initial determination was made by visiting the respective library web site and establishing the departmental member with the area of responsibility directly covering digital

collections and electronic materials. This was not always possible, as there is no single standard in place for describing these charges, and many institutions have either incomplete online staff listings or no clear assignment of responsibility. When faced with this circumstance the institutional library was contacted directly by telephone, to inquire about the most suitable representative. Table 1 lists the respondent's titles and frequency.

Table 1

Survey Participant Titles

Title	Frequency
Archivist/Collections Librarian	4
Librarian	6
Systems Librarian	5
Web Resources Librarian	1
Electronic Resources Librarian	7
Digital Librarian	4
Instructional Services Librarian	1
User/Public Services Librarian	2
Access Services Librarian	1
Head/Chief Librarian	6
Other (non-librarian staff)	5

The survey is composed of thirteen questions divided into two categories, with the questions presented to the respondent based upon their initial answer. This approach divides the institutions into three categories: Those currently using repository systems, those without repository systems but an interest in using them, and those with no interest at all. The resulting answers should supply not only the percentage of organizations currently using such systems but an idea of how this may change in the near future.

Respondents with no interest in digital repository systems did not have to supply any additional information, but for the remainder the survey split into parallel tracks, with the questions for potential adopters mirroring those presented to current adopters. This approach allows for a comparison between the expectations of those institutions considering repository systems and the actual experiences of organizations currently using them. Participants were therefore exposed to a minimum of three questions (if they had no interest in adopting these systems), six questions for current users, or seven for those falling into the planning category.

Following the initial Yes/No implementation questions, each subsequent inquiry was presented in multiple-choice format. Respondents were presented with the option to supply several answers along with an “Other” alternative for adding items not included in the available selections, with the exception of Question 5 which allowed for only one selection. Listed below are the sequence of questions and potential answers:

QUESTION 1.

Does your organization currently use a Digital Institutional Repository system?

(NO) Does your organization currently plan to implement a Digital Institutional

Repository system, or have any interest in doing so in the future?

(NO = END OF SURVEY.)

QUESTION 2.

(Category A = Current Adopters; Category B = Potential Adopters.)

A) What software platform(s) does your organization use for managing digital materials?

B) What software platform(s) will your organization consider adopting for managing digital materials?

DSpace

Fedora Commons

Eprints

Greenstone

Bepress/Digital Commons

OpenCollection/Collective Access

Custom/Internally Created

Other (please describe)

QUESTION 3.

A) Which types of researchers associated with your organization are authorized to contribute materials into the repository system?

B) Which types of researchers associated with your organization would be authorized to contribute materials into a potential repository system?

Librarians

Faculty

Research Scientists

Graduate Students

Undergraduate Students

Academic Staff/Administrators

External Contributors

Other (please describe)

QUESTION 4.

A) What types of materials produced by constituents of your organization are managed by the repository system?

B) What types of materials produced by constituents of your organization would be managed by a potential repository system?

Journal Articles

Theses & Dissertations

Unpublished Preprint Reports & Working Papers

Multimedia & Audiovisual Materials

Books and Institutional Publications

Learning Objects

Datasets

Maps

Other (please describe)

QUESTION 5.

A) Which department or organization within your institution is responsible for

management and oversight of your repository system?

B) Which department or organization within your institution would be responsible for managing and overseeing a potential repository system?

Library Director

Library Staff Member

CIO/Institutional Technology Services Administrator

Archivist

Academic Department Faculty member

Institutional President, Vice President, or Provost

Other (please describe)

QUESTION 6.

A) What benefits have resulted from implementing your digital repository system?

B) What benefits do you anticipate gaining through the implementation of a digital repository system?

Capturing the intellectual products of the institution

Providing better service to the members of the organization

Exposing the intellectual output of the institution to others

Enhancing or increasing the role of the library

Preserving the digital output of the institution

Increasing access to the organization's information assets

Enhancing institutional prestige

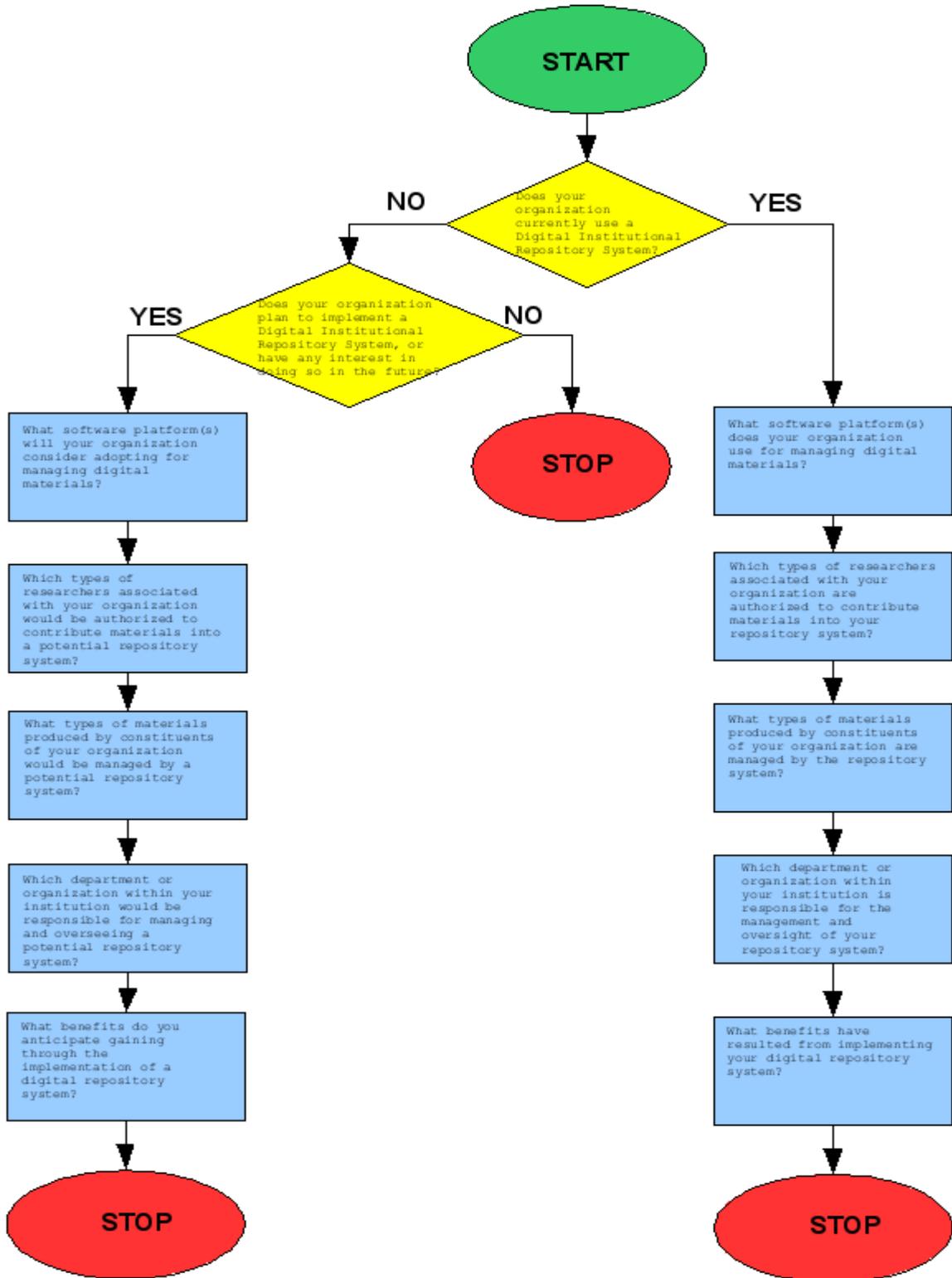
Maintaining centralized control over the institution's informational output

Reducing dependence on printed resources and collections

Other (please describe)

Figure 1, below, provides a graphical representation of the survey sequence in flow-chart format.

Figure 1. Survey question flow chart.



To facilitate dissemination of the survey it was determined that presenting it in an online, web-based format was the best option for quick assembly given the time constraints, as well as convenience and ease-of-use for respondents. Currently there are several services available for creating free online surveys, the most well-known provided by Survey Monkey. These are typically entry-level accounts offering a limited range of basic features, and provided as a means of advertising the hosted survey service and encouraging creation of a paid account with extended features. A crucial requirement of this survey was the ability to implement *skip logic*, in which the answers provided at certain points in the process could present an alternative set of questions. This feature was unavailable among the basic unpaid options of most online survey hosting platforms, limiting the selection to the eSurveysPro.com company (<http://www.esurveyspro.com/>).

Upon creating an account and designing the survey, the previously identified institutional respondents were contacted via email from a Queens College CUNY mailing address. Each participant was contacted individually on April 30, 2009, using the following message text:

Dear (*Respondent Name*):

I am a student in the MLS program at the Queens College Graduate School of Library and Information Studies conducting a survey on the adoption of Digital Institutional Repositories.

The goal of the survey is to generate a “snapshot” of the systems used by Research and Academic organizations in the City of New York as of the Spring of 2009. I would like to learn how widely used these systems for managing digital content are, the level of interest among institutions not currently implementing them, and approaches taken

toward their use and management.

The online survey should require no more than five minutes, and I would be very grateful if you could please take the time to complete it at the address below:

<http://www.eSurveysPro.com/Survey.aspx?id=9c63ab38-6173-4e8c-b2ff-c87a40e8bc23>

Participation is confidential, and no identifying information will be revealed. The survey is hosted through a free website, resulting in the display of some advertising content.

If for any reason you are unable to complete this survey by Friday, May 15 or have any questions please let me know. My contact email is david.williams1@qc.cuny.edu. Thank you in advance for your time and assistance.

Regards,

David J. Williams

Queens College Graduate School of Library and Information Studies

Data produced by survey respondents is collected automatically by the online hosting service, and presented as a series of graphs available for export into spreadsheet format. The results will provide an approximation of the rate of digital repository system adoption, along with the role of the Research Library in managing these systems and the associated expectations and real benefits provided.

4. Findings and Conclusions

Findings

Investigating the clientele and constituents of the forty-two organizations contacted for the survey reveals that the majority, constituting 36 institutions, are academic libraries serving students and faculty members. Of these, only one has an exclusively undergraduate student population, with repository systems suitable primarily for faculty researchers. Ten academic libraries support specific graduate programs, such as law, medicine, or education, and seven of the libraries included in the academic category are “central administration” offices, supporting several specialized libraries attached to specific colleges and departments. The primary mission of each of these organizations is to provide support to the educational goals of their respective colleges and universities, including the research requirements of their professional faculties.

Three selected participant organizations can be regarded as “pure research” institutions: The Population Council, the Leo Baeck Institute, and the YIVO Institute for Jewish Research. They each support research in specialized, areas, dedicated to advancing knowledge and scholarship in their chosen fields. They were also selected because they manage the publication and dissemination of much of the work produced through their research programs, unlike other institutions which fund and support researchers but are not involved in publishing the resulting work.

Two institutions are libraries attached to museums, which offer access and services in a manner similar to the research organizations described above. The final institution selected is within the New York Public Library (NYPL) system, making it a superficially unusual choice as public libraries are not typically involved in managing original research materials. Like the

museums and pure research institutes, NYPL includes several specialized research branches containing singular materials made available to scholars. These materials often benefit from digitization, allowing unconstrained and detailed access to electronic surrogates of priceless and potentially delicate unique items. This extra-pedagogical category of organization traditionally serves the advanced research community, including scholars dedicated to the pursuit of knowledge in specialized areas.

After the initial mailing of survey invitations, two participants replied via email asking for clarification of the mailing text. Both inquiries expressed concern over the suitability of their inclusion in the survey, due to the externally-managed nature of their repository systems. One respondent wrote:

“Are you interested in shared systems, or individual ones?”

And the other voiced a similar concern, writing:

“When you write of *adopting* a Digital Institutional Repository, does this indicate 1) purchasing server/software; 2) renting server space off-site; 3) something else?”

In both cases it was explained that these circumstances were addressed within the survey.

Upon closing the survey on Friday, May 15, only 17 of the initial 42 contacts responded, and of those only 15 actually completed the survey. This produces a response rate of approximately 36%, potentially reducing the statistical significance of the results.

Of the 15 respondents, eight indicated that their organization currently uses digital repository systems, for a total of 53.3%. The seven without such systems in place were presented with the follow-up question asking if their organization had any plans or interest in implementing such a system, to which three answered “Yes” and four replied negatively, ending their

participation in the survey.

Moving to the detailed questions about repository adoption, this left a total of eight current implementers and three potential users. This further reduces the insight one could gain from comparing the experiences of the first group to the expectations of the second. A breakdown of the answers follows, beginning with current implementers:

What software platform(s) does your organization use for managing digital materials?

Dspace:	3
Fedora Commons:	1
Eprints:	0
Greenstone:	1
Bepress/Digital Commons:	1
OpenCollection/CollectiveAccess:	0
Custom/Internally Created:	3
Other:	5

In the *Other* category the answers supplied were XTF, ContentDM, and “University Content Management System.” Although unclear, XTF could refer to the “eXtensible Text Framework” standard, a platform architecture for searching through collections of electronic text documents in a variety of formats (PDF, HTML, etc.) sponsored by the California Digital Library project. Neither XTF nor a general content management system fulfill the broader definition of a repository system, being more concerned with supplying access to digital material than preserving it, although advanced management features are available in some installations. Other answers include Ex Libris’ DigiTool, MDID (James Madison University’s Digital Image

Database system), pkp/ojs (the Public Knowledge Project's Open Journal Systems), and SFX (an OpenURL link resolving system).

Which types of researchers associated with your organization are authorized to contribute materials into the repository system?

Librarians:	7
Faculty:	4
Research Scientists:	2
Graduate Students:	4
Undergraduate Students:	2
Academic Staff/Administrators:	4
External Contributors:	0
Other:	2

In this instance *Other* included "Media Technicians" and the answer, "We're project-based. Researchers aren't free to contribute."

What types of materials produced by constituents of your organization are managed by the repository system?

Journal Articles:	3
Theses & Dissertations:	2
Unpublished Preprint Reports & Working Papers:	1
Multimedia & Audiovisual Materials:	7
Books & Institutional Publications:	4
Learning Objects:	0

Datasets:	0
Maps:	2
Other:	3

Other includes “manuscripts,” “lectures,” and “Historical Material and Original Documents.” It is possible that if these items are in digital format they might qualify as members of one of the existing categories.

Which department or organization within your institution is responsible for management and oversight of your repository system?

Library Director:	3
Library Staff Member:	4
CIO/Institutional Technology Services Administrator:	0
Archivist:	0
Academic Department Faculty Member:	0
Institutional President, Vice President, or Provost:	0
Other:	1

The single answer supplied for *Other* was “Library Technology Administrator (separate from IT dept.)” Upon consideration it is possible that this question is too vague, as one can liberally answer that the administrative head of a library is ultimately responsible for everything.

What benefits have resulted from implementing your digital repository system?

Capturing the intellectual products of the institution:	6
Providing better service to the members of the organization:	4
Exposing the intellectual output of the institution to others:	6

Enhancing or increasing the role of the library:	5
Preserving the digital output of the institution:	5
Increasing access to the organization's information assets:	7
Enhancing institutional prestige:	4
Maintaining centralized control over the institution's informational output:	3
Reducing dependence on printed resources and collections:	2
Other:	1

The response listed as *Other* was “Offering our students a place to post a digital portfolio of their work for potential employers to see.” Digital Portfolios have begun gaining traction as institutional policy in graduate programs in recent years, leading to a potentially interesting option not considered in previous repository surveys.

The answers supplied to the parallel questions by the three respondents without digital repository systems but with an interest in implementing them are listed below:

What software platform(s) will your organization consider adopting for managing digital materials?

Dspace:	3
Fedora Commons:	1
Eprints:	1
Greenstone:	1
Bepress/Digital Commons:	1
OpenCollection/CollectiveAccess:	3
Custom/Internally Created:	1

Other: 1

The added *Other* entry in the potential adopter reply was for PTFS, which is not a system or product but a company responsible for digitization and conversion used by the Department of Defense and other government agencies. Their *ArchivalWare* product is described as a digital library content management solution, and users include the New Hampshire and Wyoming State Libraries.

Which types of researchers associated with your organization would be authorized to contribute materials into a potential repository system?

Librarians: 3
 Faculty: 3
 Research Scientists: 3
 Graduate Students: 1
 Undergraduate Students: 1
 Academic Staff/Administrators: 1
 External Contributors: 0
 Other: 0

What types of materials produced by constituents of your organization would be managed by a potential repository system?

Journal Articles: 2
 Theses & Dissertations: 3
 Unpublished Preprint Reports & Working Papers: 3
 Multimedia & Audiovisual Materials: 1

Books & Institutional Publications:	2
Learning Objects:	1
Datasets:	1
Maps:	1
Other:	0

Which department or organization within your institution would be responsible for managing and overseeing a potential repository system?

Library Director:	0
Library Staff Member:	1
CIO/Institutional Technology Services Administrator:	0
Archivist:	1
Academic Department Faculty Member:	0
Institutional President, Vice President, or Provost:	0
Other:	1

The answer supplied for Other in this instance was “unknown.”

What benefits do you anticipate gaining through the implementation of a digital repository system?

Capturing the intellectual products of the institution:	3
Providing better service to the members of the organization:	2
Exposing the intellectual output of the institution to others:	3
Enhancing or increasing the role of the library:	3
Preserving the digital output of the institution:	3

Increasing access to the organization's information assets:	2
Enhancing institutional prestige:	3
Maintaining centralized control over the institution's informational output:	2
Reducing dependence on printed resources and collections:	1
Other:	0

Examining the results of the current adopter sequence of questions, several points become clear. The DSpace platform sponsored by the Massachusetts Institute of Technology continues to be the most popular off-the-shelf solution for creating and customizing a digital repository system. Librarians seem to be the largest contributors to these systems, although academic librarians do not typically generate the bulk of research produced in a university or college. This suggests that the repositories are not used primarily for housing original research materials, which is confirmed by the follow-up question: Multimedia files and digitized materials from existing library collections seem to be the predominant objects submitted into digital archives. A library staff member is most likely to administer these systems, with the resulting benefits centered around increasing the volume of materials available for use both within and outside of the organization. Although selection, preservation, and other traditional Archival principles are integrated into the more advanced repository systems, librarians responding to this survey were using them primarily as Content Management Systems for organizing and disseminating their largely internally-generated materials.

Comparing these results with the expectations of potential adopters, DSpace once again is the most popular option. In contrast to the evidence provided by current repository users, however, the three responding potential implementers believe that faculty and researchers will

participate more actively in their future systems. They also believe that graduate research papers and faculty articles will occupy a much larger part of their collections, and that Institutional Archivists are more likely to take a leading role in administering their installations. Expected benefits were similar to the actual benefits adopters claim, with the notable exception of increased access as the primary difference—potential adopters regarded this as less important than the management and preservation features of these systems, or the enhanced exposure and prestige they might provide.

Conclusions

The response rate of the survey, while not without value, should be as close to 100% as possible considering the nature of the organizations studied. Under the proper conditions and with adequate time I believe one can achieve a complete accounting of digital repository adoption within all research institutions in a given region. The low response rate, combined with the observed lack of sufficient clarity in several questions, indicates that this survey is most useful when regarded as exploratory in nature.

Among the answers supplied, it seems apparent that the adoption rate of digital repository systems has not increased significantly when compared to the results of previous surveys by Charles Bailey or the MIRACLE Project. Expanding the survey to cover an area beyond the limits of the City of New York would be necessary to make a comparable assessment. Respondents indicated that libraries are the leading constituents of organizations which implement these installations, managing the installations and supplying the bulk of the materials for ingestion. The repositories, however, are not primarily used to address Open Access publication of research or house student theses and dissertations as they were originally intended.

They are more often used as Content Management Systems, storing materials created within the library, or as Collection Management Systems for hosting digitized surrogates of collection resources and objects. The popularity of the CollectiveAccess project among prospective adopters seems to bear out this conclusion, although the results could be skewed by weighted participation in the survey among museum-based respondents. One approach that would mediate this trend is to classify the institutions separately and administer different survey groups, preserving anonymity while allowing subtler comparison.

Although the mechanical and software requirements of these systems is increasingly affordable and manageable, the possibility exists that the human resources required, both inside the library and in the institutions directly, are stretched too thin to participate as fully as possible in the difficult economic environment taking place during the survey's administration. Further exploration of this topic is desirable, to clarify the validity of the results and ultimately advance the case for more involvement and participation by librarians and archivists in the increasingly necessary world of digital management and preservation.

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