Alston M. Brake. The Current Status of PREMIS (PREservation metadata: implementation strategies) Implementation in American Archives and Historical Societies and Influencing Factors. A Master's Paper for the M.S. in L.S. degree. July, 2012. 92 pages. Advisor: Professor Helen Tibbo

This paper presents the findings of fifty interviews seeking to discover the current status of PREMIS (PREservation metadata: implementation strategies) implementation in American archives and historical societies and the factors influencing these implementation decisions. The survey was designed to address two research questions: are American archives and historical societies implementing the PREMIS standard for preservation metadata and what barriers are being discussed by staff at these repositories prior to implementation decisions. Additionally, for those repositories THAT had not implemented PREMIS, the interviews sought to discover how else, if at all, staff was addressing the preservation metadata needs of the digital objects.

Findings indicate that AMERICAN ARCHIVES HAVE OVERWHELMINGLY CHOSEN NOT TO IMPLEMENT PREMIS IN ANY WAY. STUDY participants identified many barriers to implementing PREMIS for the description of digital objects. They also suggested support that would help them become better able to implement PREMIS. The interviews shed light on the barriers causing the staff at American archives the most difficulty in their efforts to create any kind of metadata for their digital objects, using any schema or standard.

Headings:

Archives

Digital Libraries

Primary Sources

Special Collections

PREMIS

Preservation metadata

CURRENT STATUS OF PREMIS (PRESERVATION METADATA: IMPLEMENTATION
STRATEGIES) IMPLEMENTATION IN AMERICAN ARCHIVES AND HISTORICAL
SOCIETIES AND THE FACTORS AFFECTING THIS ADOPTION RATE

by
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Introduction

Because digital information has become integral in the foundation of our modern society, cultural heritage institutions, such as museums, libraries, archives, and historical societies, have increasingly provided access to their collections online by posting digital objects. These collections of born-digital and digitized primary source materials have been termed "digital collections." "In a report published in 2010, OCLC Research stated that 97% of their respondents had completed at least one digitization project and/or have an active digitization program for special collections" (Dooley and Luce, 2010). It was noteworthy that university/college and public libraries, university/college archives, and national institutions participated in their study. Since so much information has now become available online, patrons have come to often expect repositories to have most or all of their materials digitized. The high patron demand for online access to collections has encouraged repositories to invest more in digitization and digital preservation programs.

This study focuses on digital collections that archives and historical societies have created and maintain. Archives contain "materials created or received by a person, family, or organization, public or private, in the conduct of their affairs and preserved because of the enduring value contained in the information they contain or as evidence of

the functions and responsibilities of their creator."[1] Archives often exist as part of larger

organizations, such as universities and private companies, although sometimes they are

self-governing. Corporate archives collect, maintain, protect, and appropriately discard

the records created by the corporations' employees and subunits during the conduct of

business. University and college archives perform the same functions with records

related to business operations, including those created by institutional administrators,

instructors, students, campus organizations, departments, and committees. Additionally,

university and college archives collect records related to the subject matter of academic

programs and institutional strengths. For example, the university archives at an

institution with a strong academic program in computer science would be likely to collect

archival materials on the development of the computer science industry and the field's

scholarship.

   A historical society has been described as "an organization that seeks to preserve and

promote interest in the history of a region, a period, or a subject."[2] Historical societies

have frequently been non-profit organizations that collect materials related to a particular

geographic area, such as a state, county, or town. Historical societies have typically held

the same kind of materials as archives, such as correspondences, meeting minutes, and

other legal records, and treat them in the same manner.

   The digital collections of archives and historical societies contain primary sources,

which the *SAA Glossary of Archival Terms* has defined as "Material that contains

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[1]Archives. In *SAA Glossary of Archival Terms*. Retrieved from
http://www.archivists.org/glossary/term_details.asp?DefinitionKey=156

[2]Historical Society. In *SAA Glossary of Archival Terms*. Retrieved from
http://www.archivists.org/glossary/term_details.asp?DefinitionKey=1758

firsthand accounts of events and that was created contemporaneous to those events or later recalled by an eyewitness."[3] While libraries have been primarily concerned with providing access to published materials, the mission of archives and historical societies was to provide access to unique, unpublished materials that provide information through a more direct lens.

The primary source materials included in the digital collections of archives and historical societies can be both born-digital items and digitized physical items. The term "born-digital" refers to digital files, also called digital objects, which have not been reproduced from analog items; the digital files themselves were the original manifestations of the items. Oppositely, digitized primary source materials were digital files that have been created by either scanning or taking a digital photograph of analog items, which were held in the repositories' collections. These digital files that resulted from digitizing photographs became representations of the original analog items, and were therefore called digital surrogates.

By digitizing primary source materials, archives and historical societies are able to make their collections available to more researchers in more locations than ever before. Digitization gives analog materials the ability to transcend place. Therefore, scholars will be able to access primary source materials without incurring or being prohibited by the cost of travelling to the items themselves.

Archives and historical societies have chosen to either share digital images of an entire archival collection online or select individual images from one or multiple archival collections and present them as an "exhibit." Archives and historical societies qualified

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[3]Primary Source. In *SAA Glossary of Archival Terms*. Retrieved from
http://www.archivists.org/glossary/term_details.asp?DefinitionKey=1647

for inclusion in the present study if their websites provided digital access to primary source materials contained in their collections, regardless of the manner in which the items were presented.

Digitizing materials and maintaining digital objects over an extended period of time requires a substantial commitment of resources, including server space, staff time, and monetary expense. Developing digital collections requires a significant investment, and the digital objects they contain may be lost permanently if preventative measures to safeguard the materials are not taken. Cultural heritage institutions have realized this threat of loss and many would like to address the issue but remain unsure exactly how to begin because best practices for digital preservation have been slow to develop. Digital preservationists agree that assigning metadata to digital objects is one way to help prevent future data loss.

The interviews with archivists and other information professionals conducted for this research sought to discover the current status of implementation of PREMIS (PREservation Metadata: Implementation Strategies) preservation metadata standard by American archives and historical societies for their born-digital and digitized primary source materials. Additionally, for participants who said their employing repository had not implemented PREMIS, the interviews sought to discover if implementing PREMIS had been considered by the staff at the repository, and if so, what potential barriers to implementation had been discussed. Additionally, for all participants who said their employing repository had not implemented PREMIS, the interviews sought to learn about the current practices relating to preservation metadata for digital objects in place at the respective repository.

Literature Review

In modern society, the overall quantity of digital data, which comprises digital objects, has grown exponentially during the past several decades. These digital objects are fragile because of their inherent properties. Much has been written about these properties, the threats they pose to digital preservation, and the challenges faced when combating them. Also, much scholarly literature existed that addressed why and how metadata for digital objects should be created and managed. The need to create and store metadata for digital objects has been widely articulated, but few studies to investigate the factors affecting the adoption rates of various preservation metadata standards, including PREMIS, within the archival community have been conducted. This literature review will seek to detail the work that has been conducted on these topics.

Role of Metadata in Modern Society

The literal translation for metadata, data about data, provides a simple but nonetheless helpful definition of the term when trying to understand the role that metadata plays in our increasingly global digital society.

As the capabilities of people to share digital information have continued to increase, so has the interconnectedness of the global community. Many individuals and companies have the ability to easily and often inexpensively interact socially and professionally with others thousands of miles away via methods such as email and instant messages and video conferencing. Information professionals in a wide range of

disciplines have learned to create, maintain, harvest, and otherwise use the metadata assigned to digital files to support societal infrastructure functions such as commerce, distribution of natural resources, the availability of medical care, and intellectual scholarship. Hospitals and medical offices are now legally required to keep patient records in electronic format. Therefore, medical staff need to assign metadata to these digital files to ensure their correct identification, which prevents misdiagnosis and results in improved patient care, and to increase the security and longevity of these records. Retail businesses have come to use metadata in their software programs to manage their inventory accurately and effectively and to record and process shipping, receiving, and financial transactions.

People frequently share their stories and digital photographs with others via social media websites such as Facebook, Flickr, and Photobucket. After uploading their photographs, users "tag" the digital images with descriptive terms of their own creation, thereby creating metadata about the images, which is then used for internal and external search and retrieval.   Such user-created tags are a type of uncontrolled vocabulary called folksonomy. Cultural heritage institutions have recognized that many of their patrons and potential patrons have developed extensive experience using such websites, and therefore these repositories have been choosing to share digital images of materials from their collections via such websites in hopes of creating an interactive and consequently more meaningful experience for current patrons and reaching a larger audience.

It is a current trend for cultural heritage institutions to allow, and even encourage, patrons to create metadata for the institutions' digital objects. "Crowdsourcing" has been accepted as the term for such activities, which attempt to harness the knowledge and

expertise of the repository's patron base, thereby lessening the workload on staff and engaging patrons with the repository materials. For example, patrons may transcribe digitized manuscripts or label photographs that had been posted online by cultural heritage institutions. The majority of scholarly articles on the topic have been written in the last two years, which suggest that as the number of digital objects made available by cultural heritage institutions continues to grow, the importance of crowdsourcing to metadata creation for those digital objects will increase as well. The literature provided examples of how crowdsourcing has helped cultural heritage institutions increase the access to and information available about their collections. The topic of metadata creation on prevalent social media websites has received attention in the library and information science discipline in literature, on blogs, and at conferences and workshops. For example, a post on the Mod Librarian blog detailed how crowdsourcing was being used to create metadata tags for the archive at the George Eastman House International Museum of Photography and Film.[4] Saylor and Wolfe (2011) wrote about the University of Iowa (UI)'s Civil War Diaries Transcription Project in which outsourced contributions were gathered on a web site developed for that purpose.

People around the world benefit from metadata when they search for information on the internet because search engines use metadata to retrieve results likely to fulfill the individual's informational needs. A printed phone book has always contained metadata about businesses, such as their street addresses and phone numbers. In order to purchase goods online, consumers routinely provide retail websites with metadata about their credit cards.

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[4]This was the topic of the Sept 5, 2011 post called Metadata Monday: Crowdsourcing Metadata.

Types of Metadata and Their Functions

Archives, libraries, museums, and other cultural heritage institutions assign metadata to both their physical and digital resources to aid in many purposes, including description, identification, and preservation. The *SAA Glossary of Archival Terms* states that metadata is used for "documenting the identification, management, nature, use, or location of information resources (data)."[5] Metadata is categorized by the kind of information it records.

Descriptive metadata is used to identify and describe information resources themselves and their content. This kind of metadata has traditionally received the most attention in cultural heritage institutions because it best facilitates resource and content discovery. "Descriptive metadata as an application method for digital document access has established itself over the last few years" (Groenewald & Breytenbach, 237). It is often described as a "value-added service," which shows that the information and library science community widely agrees upon its usefulness. The wealth of literature available on the purposes and various applications of descriptive metadata supports the assertion that descriptive metadata is well entrenched in the practices of cultural heritage institutions.

Archives and historical societies create descriptive metadata in finding aids to provide information about the contents of their collections, while libraries create bibliographic records to describe resources, such as books, journals, and DVD's. Additionally, all types of cultural heritage institutions may assign descriptive metadata to their digital objects. This may be done either on a social media website as discussed

[5]Metadata. In *SAA Glossary of Archival Terms*. Retrieved from http://www.archivists.org/glossary/term_details.asp?DefinitionKey=123

previously, within a content management system or Institutional Repository, or in a spreadsheet. For example, if a repository staff member created and recorded a title for a digital image that described what the image showed, who (if anyone) was in it, where it was taken, and when it was taken, they have created descriptive metadata about that digital object.

Structural metadata is defined by the *SAA Glossary of Archival Terms* as "Information about the relationship between the parts that make up a compound object."[6] For example, digitally-drawn architectural blueprints are stored as CAD files, which are complex and contain multiple layers. Structural metadata is needed to document the relationships between these layers in order to preserve the ability to view them both individually and in combination, which yields various renderings. Structural metadata helps ensure that the functionality of the multiple layers is not lost over time.

Administrative metadata is used to manage collections and resources. It documents how, where, when, and from whom the collection or resource was acquired, and information about any rights holders, any reproductions that have been made, and the file's directory location. For electronic journals structural metadata stores the information about the relationships between various volumes, issues, and pages.

The technical metadata assigned to a digital object records information about the digitization of that object, the hardware and software required to access the object, the object's format, and technical characteristics specific to its format. Information that documents the storage and location of the object is sometimes included in this category.

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[6]Structural Metadata. In *SAA Glossary of Archival Terms*. Retrieved from http://www.archivists.org/glossary/term_details.asp?DefinitionKey=1588

Preservation metadata can be described as the information that is used to ensure the long-term preservation and access of resources by protecting them from intentional harm and natural deterioration. Deborah Woodyard discussed the relationship between metadata and digital preservation in her 2002 article. She stated that preservation metadata should aim to record all the information needed to enable access, such as the technical details about a resources' file(s) and structure, custodial actions performed on the resource, and who should perform those preservation actions. Data refreshing and migration would be examples of such custodial actions that are intended to help preserve the resource. In order to fully understand the importance of preservation metadata, one must first understand the impermanent nature of digital files themselves and the other threats they face.

The Impermanent Nature of Digital Files

In their 2010 article, Groenewald and Breytenbach discussed how cultural heritage institutions have a well-established practice of protecting historical artifacts and information resources for current and future use. Repositories have created and followed procedures for the care of these materials for decades. The custodial role of librarians, curators, and archivists became established as a societal expectation. Librarians, curators, and archivists are trying to create and implement the same kind of procedures for proper care and preservation of the digital objects that have been and will continue to be added to their collections. However, establishing digital preservation policies requires repositories to overcome many challenges related to the inherent characteristics of digital objects.

Digital files may be described as impermanent by their very nature. In her 2004 article "The digital preservation conundrum, Part 1," Abby Smith discussed how digital preservation was complex, costly, and hard to achieve because digital information "is by nature malleable, unfixed and unfixable, immaterial and without stable physical manifestation" (p.107). Cultural heritage institutions know how to handle resources made of paper and film, which are called analog resources, because these materials decay in predictable, systematic ways due to interactions with environmental factors, such as fire, water, air temperature, and humidity. Repositories now have the added benefit of the wisdom acquired during the decades spent caring for these formats. Only in the case of a disaster, such as unexpected fire, will analog materials decay suddenly. Instead, they usually decay slowly over long periods of time. For example, book pages may disintegrate a small piece at a time over the course of years. Therefore, with print and film materials, it is common to lose the ability to use some parts of a resource while still retaining the ability to access and understand the remaining ones. In the example above, a person could still read many pages of the book, understand the meaning of those pages, and most likely understand the meaning of the resource as a whole unless the number of pages missing was extensive. Partial data loss such as this is the expected and most common form of decay of analog records.

Oppositely, the decay of digital files is usually sudden, without obvious cause, and total. Digital files are comprised of numeric code, which contains hundreds and thousands of individual numbers called bits. Digital files will only render correctly, completely, and authentically when the whole sequence of bits is present and in the correct order. Therefore, the loss of a single bit will often result in data corruption and

unreliability and sometimes in total data loss. "When the ability to translate the binary code is lost the use of the resource is also lost" (Woodyard, 2002, p.122). For example, the required software, such as Notepad or Microsoft Word, cannot open only a part of a word document.

Digital files are also impermanent because their inherent characteristics make them subject to external threats. With relative ease, digital files can be altered in ways that distort and fundamentally change the meaning of the data. Sometimes hackers illegally access the back-end systems of repositories to alter or destroy digital objects. Files can be opened, have their data changed, and then be resaved in ways that make attempt to mask the fact that those changes were made. They might be trying to change how history is recorded or to remove information they view as sensitive or offensive. Without appropriate preservation metadata, such changes would not be identifiable, which could result in patrons using fraudulent digital objects, which could in turn result in incorrect scholarship.

Hardware failure remains a substantial threat to the preservation of digital files. Archivists, curators, librarians, and other information professionals have known for some time that digital files will likely to be lost if the physical media storing them was damaged or broken, which could happen as a result of exposure to physical elements and repeated use. For example, cd-roms might warp or melt during a building fire. If so, the data stored in the digital files on the cd-rom would be lost because the cd-player or drive would not be able to play the physical media. Furthermore, pieces of hardware, such as servers, computer hard drives, and flash drives, have their own lifespans and naturally wear out over time. Without the hardware required to read the file and the software to

make sense of it, the content and meaning of the file cannot be discovered, and the result is the same as total data loss. As digital media evolves, file formats and the software and hardware used to make meaning from digital files are replaced by newer ones.

Because digital files can be altered so easily, the viability, renderability, understandability, authenticity, and identity of digital objects will be compromised unless various digital preservation methods are used to prevent such. For example, files can be destroyed by viruses if the system/server/computer storing or being used to view them is unprotected or in need of updates. In his 1996 report *Preservation in the Digital World*, Conway illustrated the differences between the nature of physical materials and digital ones and the effect those differences have on preservation efforts: "The digital world transforms traditional preservation concepts from protecting the physical integrity of the object to specifying the creation and maintenance of the object whose intellectual integrity is its primary characteristic." Groenewald and Breytenbach's study (2011) illustrated the fragility of digital files by showing the disparity between the average lifespan of physical photographs and digital photographs.   Few of their workshop attendees indicated that they still possessed the first photo they had taken on a cell phone, while many said they still had similar "first photos" taken with cameras using film (p.237).

The Need for Metadata

Therefore, digital objects need metadata, especially preservation metadata, because of this inherent impermanence. The many cases of digital information loss documented on the Dataloss Database (http://datalossdb.org/index/largest) have provided evidence that necessary actions to ensure the safety and long-term preservation of such

files were often not taken. Many of these losses were substantial and therefore costly to the company and damaging to its reputation. Also, such losses sometimes negatively impacted customers' lives if the data lost was of a financial or personal nature.

Preservation metadata has historically received the least attention of any kind of metadata because its creation was not seen as a value-added or user-centric service. These authors also stated that "Methods to minimize the loss of digital data are often ignored, thus the use of metadata structures embedded in digital objects from the outset thereof are recommended as a starting point towards good preservation principles" (p.237).

Preservation metadata often has been considered a subset of administrative metadata but it may also include parts of descriptive and structural metadata as well as other elements (Woodyard, 2002, pg. 121). For the purposes of this study, I told participants that preservation metadata was considered to be any metadata that their repository's staff had a policy of recording for the purpose of preservation, even if it might also be considered administrative, technical, or structural. For example, PREMIS specifically addresses rights information, which is frequently considered administrative metadata.

What is PREMIS?

PREMIS was developed as a data structure standard, used for the purpose of defining the containers that hold data. PREMIS stands for PREservation Metadata: Implementation Strategies, and was developed by the PREMIS Working Group, which was sponsored by the Library of Congress (LOC). It consists of the PREMIS Data Dictionary (PDD), which defines elements within the data model's four semantic units

called entities. These are Object, Agent, Rights, and Event. Using the example of a photographic print, the Object Entity would contain information describing that intellectual entity, such as file format, date created, and file size. The Rights Entity would contain information on allowed uses of the object as well as the physical actions that could be performed on it and accompanying justification. For example, the Rights Entity should detail if use copies of the digital file can be made and for what purposes they are allowed to be used, such as whether or not the digital image can be made available online. The Event Entity should record information about physical acts done to the object, such as the process of digitizing the photographic print and future preservation actions like format migration. The Agent Entity should contain information about who performed those acts and the operating system and software used to perform them.

The interviews discussed in this paper asked participants if their archive or historical society had implemented PREMIS in any way. For the purposes of this research, "implementing PREMIS" was defined as using any of the data dictionary's elements from any of its entities to describe digital objects, regardless of whether or not the repository chose to use the accompanying XML schema.

When Version 1.0 of the data dictionary was released in 2005, the Working Group also released five XML schemas, four of which associated appropriate XML elements with each of the PREMIS entities and a container schema that was designed for any grouping of those entities (Guenther, 2007). When Version 2.0 was released in 2008, only the container schema accompanied it. This was a substantial simplification that was intended to make implementation of the XML schemas much easier, so I hypothesized

that this change might have positively encouraged archives staff to adopt the standard in the years since.

Most recently Version 2.1 was released in 2011 but contained few modifications from Version 2.0 (Guenther, 2007).

The Goals of PREMIS

It is clear the creators of PREMIS developed the standard with flexibility and interoperability in the front of their minds because they felt these characteristics were essential to making the standard easier to implement and therefore more useful in the real-world. According to Rebecca Guenther, PREMIS was intended to be "an implementable set of 'core' preservation metadata elements that has broad applicability within the digital preservation community" (2007, p.19). Guenther is considered the world's foremost expert on PREMIS because she has been involved in all stages of its development since initial planning and has written about and presented papers on the standard many times. She stated that the PREMIS semantic units were intended to be "implementation-independent, rigorously defined, and practically oriented" (p.19). This statement implied that the working group tried to develop the standard to provide some accommodation for the resource limitations faced by cultural heritage institutions. As of Version 2.0, it was possible to use extensions "from within PREMIS that permit embedding of metadata from other metadata schemas" (Dappert & Enders 2008). This revision demonstrated the Working Group's commitment to improve their standard's interoperability in order to encourage its adoption by institutions that already had metadata standards in use and ensure its continued usefulness. Additionally, Guenther wrote that the Working Group recognized that XML was widely used for expressing

metadata and therefore chose to develop the schemas believing their existence would

make PREMIS implementation easier, thereby encouraging institutional adoption of the

standard (2007).

The Working Group tried to ensure the standard's flexibility by designing the data

dictionary to be "technically neutral," which means "no assumptions are made as to the

specific digital archiving system, the database architecture, or the archiving technology"

(Guenther, 2007). "Most published specifications for preservation-related metadata are

either implementation specific or broadly theoretical" (Caplan, P., & Guenther, R., 2005).

This is the key difference with PREMIS, which provides it with the potential to unite the

digital preservation community and its sub-units.

The interviews conducted in the present study were designed to help determine

whether or not PREMIS had accomplished the goals its creators had for it within the

context of the American archival community.

PREMIS implementation in archives

The PREMIS implementation registry website describes digital projects

completed by cultural heritage institutions that utilize the PREMIS standard in part or

whole. As of March 2012, 45 projects were listed.[7] Most were created and maintained

by private companies and libraries and over half of them were located outside the United

States. Only a handful of the projects were products of archives and none were of

historical societies. While it is possible that other repositories may have implemented

PREMIS and neglected to inform the PREMIS Working Group to update the website

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[7]Digital projects worldwide that have used PREMIS standard are located online at the
PREMIS Implementation Registry's website:
http://www.loc.gov/standards/premis/registry/premis-fulllist.php

accordingly, the registry seems to suggest that implementation is low within the archival community. Some case study literature also existed, and it confirmed that a fair amount of cultural heritage institutions around the world had implemented PREMIS during the development of digital projects.[8] However, only one of four case studies was about PREMIS implementation in an archive.[9]

Longitudinal studies on PREMIS implementation

The existing literature also contained longitudinal studies on PREMIS implementation. "The amount of information required for preservation management will be prohibitive if full manual data entry is required" (Woodyard, 2002, pg. 124).

Woodyard-Robinson (2007) examined 16 institutions that were beginning to implement PREMIS in order to determine which entities and semantic units they were planning to use. Her study showed that many institutions were still in the planning phase of that process at that time.

Alemneh and Hastings (2010) identified factors affecting PREMIS adoption in various kinds of cultural heritage institutions.[10] This study collected data from 123 participants in 20 countries. Relative advantage, compatibility, complexity, trialability, observability, and institution readiness were determined to be factors. Respondents cited

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[8]These case studies are: Knight, S. (2005), Dappert, A., & Enders, M. (2008), Gunia and Sandusky (2010), Donaldson, D. R., & Conway, P. (2010).

[9]The article by Donaldson, D. R., & Conway, P. (2010) details the Florida Digital Archive's experience implementing PREMIS.

[10]Alemneh also published an abbreviated article about this study: Alemneh, D. (2009). Expanding the search for digital preservation solutions: Adopting PREMIS in cultural heritage institutions. *Proceedings of the 9Th ACM/IEEE-CS Joint Conference on Digital Libraries.* Austin, TX. 357.

lack of training/expertise as the most common barrier to implementing PREMIS. This study also identified eight factors that encouraged PREMIS adoption; "adopting the PREMIS is seen as a practical necessity by our institution" was the most common reply given by 58.9% respondents. "Institutional readiness, trialability, and relative advantage were the three best predictors of PREMIS adoption" (2010. Fewer than 3% of respondents had implemented PREMIS fully. The study also asked participants "to identify tools they use for preservation metadata generation and/or extraction of technical metadata" and found that most respondents used at least one format identification tool. This study further illustrated the importance of guidance on how to implement PREMIS with METS because approximately 43% of their survey respondents reported their institution using METS with metadata in their digital library applications.

Alemneh and Hastings suggested that their research had demonstrated the need to continue investigating factors that influenced the adoption of PREMIS. "Higher education institutions, national libraries, and archives tend to show relatively high level of participation and engagement in terms of PREMIS adoption compared to museums and other type of cultural heritage institutions" (2010). The most current version of PREMIS had not yet been released when they conducted this study.

The present study explored factors affecting PREMIS adoption in American archives and historical societies. For those who had implemented PREMIS, it sought to discover which PREMIS semantic units and entities were most and least used. For archives that had not implemented PREMIS, this research also investigated how each institution had chosen to address preservation metadata. The present study focused on a more specific population, American archives and historical societies, than that of any

previous research or available statistics. Additionally, how the passage of time and the

release of the latest version of PREMIS had affected PREMIS adoption was illuminated

by the present study. The knowledge generated by the present research will better inform

the archival community's ongoing discussion of best practices and standards regarding

preservation metadata. It will also provide information that could guide the PREMIS

maintenance group's creation of additional versions of the standard and additional

implementation support.

Methodology

The purpose of this study was to determine the degree to which American archives and historical societies are implementing the PREMIS (PREservation Metadata: Implementation Strategies) standard to describe their digital objects and the factors affecting this adoption rate. I conducted interviews with a staff member responsible for creating and/or maintaining the metadata for digital objects at 50 American archives. Interviews were chosen as the method for collecting data because this would yield deeper, more meaningful data than a survey.

To identify the population of possible participants, I extracted a list of archives and historical societies in the United States with websites containing either digitized or born digital content from two sources. The first, the "Repositories of Primary Sources" (RPS) maintained at the University of Idaho, is "A listing of over 5,000 websites describing holdings of manuscripts, archives, rare books, historical photographs, and other primary sources for the research scholar" (http://www.uiweb.uidaho.edu/special-collections/Other.Repositories.html). From this source, I removed the links to repositories in the Canadian provinces. Then I removed the links to all other types of cultural heritage institutions except for archives and historical societies. I randomly selected 50 repositories from the remaining list. I checked the website of each to determine if the repository provided access to primary sources such as documents, images, and sound recordings in digital format. I removed repositories that did not provide access to such material from the list and randomly selected replacements. I did not remove repositories from the list if their only digital content was presented as part of an "exhibit" style project.

Once I had identified 50 repositories that provided online access to digital primary source materials, I searched their websites to determine which staff member I believed would be most responsible for creating and maintaining the metadata for those digital objects. Generally, these contacts were metadata librarians, digital project librarians, digital archivists, university archivists, or archivists.

Sometimes I was unable to determine the best contact person from the website because either it did not provide the contact information of individual staff members, or I identified several possible contacts. In these cases, I called the repositories to determine who would be the most appropriate person to receive my email message. If I left a message that was not returned, then I sent my possible participant email to the corresponding general email address.

Effort was made to ensure that I spoke with the most knowledgeable person at each repository. If several staff members were responsible for the metadata creation and maintenance, I discussed the repository's organizational structure and the specific job duties of both individuals with my initial contact person to determine who would be the best person to interview for the study. If this discussion left any uncertainty, I then discussed these topics with the other staff member(s) to clarify their responsibilities and make sure the most appropriate person or people was/were chosen. At 14 repositories, the first person I corresponded with referred me to another employee. In three cases, I spoke with two people simultaneously via speaker phone because they requested to be interviewed together and both were responsible for managing the metadata associated with the digital objects. The participants' answers to the interview questions reassured me that I had spoken with the most knowledgeable person.

Next, I emailed the initial 50 potential subjects and asked if they would be willing to participate in a telephone interview regarding whether or not their employing repository had implemented PREMIS and what barriers to implementation the staff had discussed. Appendix B contains the text of this email. I scheduled times for phone interviews via email message with those who consented to be part of the study.

I received few responses from the 50 possible participants I first contacted. Therefore, it was necessary for me to continue randomly selecting and emailing potential participants throughout nearly the entire interview period in order to recruit the desired number of participants. After a month, I again sent email messages to those out of the first 50 possible participants who had not responded.

Because of the low response rate, I began trying to recruit participants from a second source, the Society of American Archivists' Metadata and Digital Object Roundtable roster, which was available online through http://saa.archivists.org. I created a list of the repositories represented by the membership, and then, randomly selected institutions as before.

I sent email messages to the possible participants identified from the second source. I included a sentence stating that if I did not receive a reply by April 5, 2012, I would then call the repository to try to arrange a telephone interview. The text of this email is contained in Appendix C.

Additionally, I selected a purposeful sample of large repositories, which I defined as those having the equivalent of eight or more full-time employees who work with the archival materials. The time of part-time students and staff was combined and included

in this calculation. This sample contained thirteen participants, which were selected from both sources.

For a few of the email messages I sent, I received error messages in return, which stated that the message could not be delivered. In these cases, I returned to the repository's website and tried to identify which staff member was the next most appropriate to receive my email message. If I could not determine a second best choice, I sent the possible participant email message to a main email address for the repository or appropriate repository department. In some cases, possible participants sent me a response, referring me to one of their colleagues. In these cases, either the respondent forwarded my email to the person they felt was most appropriate to answer my study's questions, or I emailed the person to whom I was referred.

I received approval from the IRB to conduct the interviews. During most of the interviews, I typed notes about the participant's responses directly into the computer while talking to the participant on speaker phone in my home office. Several times I needed to conduct a phone interview while in a semi-public place. In those cases, I used my cell phone in private mode and wrote on a printed copy of the interview questions. In all scenarios, the respondents' privacy was secured as I was the only person who could hear their answers. On average, the interview lasted 10-15 minutes for those whose employing repository had not implemented PREMIS and 25 for those whose employing repository had implemented PREMIS or had a specific implementation plan.

The first interview question was the same for all interview participants: "Does your repository apply the PREMIS standard for preservation metadata to your digital objects in any way?" "In any way" was defined as implementing any of the entities and

elements from the data dictionary and/or any part of the accompanying XML schema. Participants were not required to be using parts of both in order to answer "yes" to the question. Those who answered "yes" were then asked a different set of questions than those who said "no."

The question set for those who answered "yes" consisted of 15 items. Throughout this paper, question numbers followed by A are used to identify questions asked to these participants. The first three questions asked respondents which specific PREMIS entities and elements had been implemented at their employing repository. Next, participants were asked if their repository had any internal policies about how to apply PREMIS, to elaborate about those policies, and state whether or not they were documented.

I asked these participants to provide me with a sample digital object and correlating PREMIS record from their repository if possible. After their interviews, two participants sent these materials to me as attachments to email messages. These objects and corresponding records were only meant for my personal use and not for public distribution. Since the sample size is so small, the materials provided could compromise the participants' anonymity if they were compared with the participants' other answers, which described how PREMIS was implemented at their repository. Therefore, these objects and corresponding records are not included in this report.

One question asked, "When deciding whether or not to implement PREMIS at your repository, what potential barriers to implementation did you discuss?" One question asked, "What resources (training, literature, membership on listserv, etc.) did you use in preparing for your PREMIS implementation?" One asked how the PREMIS metadata interacted with the various systems already in use by the repository's staff, such

as content management systems and institutional repositories. Another asked if PREMIS had fulfilled their repository's preservation metadata needs. Another asked, "Are there issues with PREMIS currently that you feel its creators need to address?" Another asked, "Is there any specific type of support not currently in existence that you think would help your repository's staff become better able to implement PREMIS?" One question asked, "Does your repository use another metadata standard in addition to PREMIS, such as METS or DublinCore, for preservation metadata?" The last question asked, "What did your repository do with regards to preservation metadata before it started using PREMIS?"

The participants who answered "no" to the first question were then asked whether or not their repository's staff had discussed implementing PREMIS. Throughout this paper, question numbers followed by B are used to identify questions asked to these participants. Interviewees who responded by saying their repository's staff had not discussed implementing PREMIS were then asked four more questions. The first one asked, "Does your repository assign preservation metadata to its digital objects in any way?" The next asked, "Are your repository's preservation metadata needs being met?" Another asked, "Is there any specific type of support not currently in existence that you think would help your repository's staff become better able to implement PREMIS?" The last question asked, "How likely is it that your repository's staff might consider or reconsider implementing PREMIS in the future?" For the last question, respondents chose from the following answer choices: "very likely," "likely," "somewhat likely," and "not likely."

Respondents who answered "yes" to the first question, stating the staff at their employing repository had discussed implementing PREMIS, were then asked the two additional questions. These two questions asked what barriers their repository's staff had discussed when deciding whether or not to implement the standard and which barrier was the largest reason they chose against implementation. Then, the "yes" group of participants was asked the same four questions as the "no" group, which are listed in the previous paragraph.

I assigned identifiers to each interview, which consisted of the letter A followed by consecutive numbering beginning at 1. I typed or wrote this identifier on the top of each participant's interview answers. To protect the privacy of participants, I am not including the names of their employing repositories in this paper. Instead, participants will be referred to only by these randomly assigned identifiers. These identifiers were assigned solely for the purpose of citing interviews throughout this paper and were not attached to any key containing personally identifying information.

After all 50 telephone interviews were completed, I analyzed the data by doing content analysis on my interview notes. For question 8B, participants chose their answer from a Likert scale. All other questions were free-response. For these questions, comments fell into broad categories, which I organized into tables accordingly by question. The next section of this paper presents these findings.

Findings

I sent email messages to and called possible participants between January 20, 2012 and April 26, 2012. I conducted interviews between January 25, 2012 and April 27, 2012. In total, I asked individuals at 278 different repositories to participate in my research study, and conducted 50 resulting telephone interviews. Interviewees were both male and female, but for the sake of simplicity, all participants will be referred to as "she" throughout this paper, even though the participant may actually be male.

Individuals at 39 repositories declined to participate, and 11 of those voluntarily told me that their employing repository had not implemented PREMIS. Since 28.2% of declining participants voluntarily stated that PREMIS was not being used at their repository, this may also be the case for up to a third of all American archives and historical societies.

I did not receive responses from individuals at 189 repositories. My study had an overall response rate of 32.01% and a participation rate of 17.98%. I spoke with several possible participants via phone who said they had not received my email message, and they suggested it likely got caught in a spam filter. This may likely have occurred in some other instances where I sent email messages to which I did not receive a reply.

The fifty participants were employed by state archives, college and university archives at both private and public institutions, government archives, and self-governed archives. The majority of the participants (28) worked at a public college or university. The second largest number of participants (17) worked for private colleges and universities. Four participants worked for government archives, and one worked for a self-governing archive. This same descending order of participation by type of repository

is reflected in both the samples of large and small repositories. Interestingly, no staff members from historical societies agreed to participate, even though I attempted to recruit from this kind of repository as well.

Seven of the 13 large repositories represented by the participants were at public colleges or universities. Three participants each worked at private colleges or universities and at government repositories.

Twenty-one of the 37 small repositories represented were housed at public colleges or universities. 14 were at private colleges or universities. One participant represented a government archive, and another represented a self-governing archive.

The mean FTE equivalent per repository for the entire sample population of 50 participants was 7.487. The mean FTE for the sample of 13 large repositories was 12.41. The mean FTE for the sample of 37 small repositories was 3. 7. Four interviewees reported having only one FTE at their repository and identified themselves as a "lone arranger." Two participants reported having the equivalent of less than one FTE at their repository.

The mode of the FTE equivalents for the entire sample was 6, which occurred at six repositories. The range of the entire sample was 37.5, with the smallest repository having 0.5 FTE and the largest having 38 FTE. The greatest data outliers were the two largest FTE equivalents: 30 and 38. The impact of staff size on the implementation of PREMIS and other metadata standards in American archives and historical societies will be discussed later in this paper.

Repositories Where PREMIS Had Been Implemented or a Detailed Implementation Plan Had Been Developed

This section will present the findings of the questions specific to repositories

where PREMIS had been implemented or a detailed implementation plan had been

developed. The interviews revealed that only three of the 50 repositories (6%)

represented by the study participants were currently implementing PREMIS in some way

or had developed a specific plan to do so. Table 1 shows the number of participants who

said their employing repository had implemented some part of the data dictionary and/or

the XML schema.

Table 1

Implementation of the Data Dictionary and/or XML Schema (Question 1A)

# of Participants	XML Schema	Data Dictionary
Implementation	1	3
No Implementation	2	0

Two participants reported that PREMIS had been implemented in some way at their

employing repository already. One of these participants (A5) reported that both the data

dictionary and the accompanying XML schema were being used. The other (A22) said

her repository's staff had implemented some of the data dictionary's elements but had not

implemented any part of the XML schema and did not intend to do so at a later date. The

third participant (A29) reported that her repository's staff had made the decision to

implement the emerging standard and had since developed an implementation plan. She

and I determined that the plan had enough technical specificity for her to answer the

questions assigned to this participant group. A29 said the staff at her repository currently

planned to implement the data dictionary but not the XML schema. However, the

possibility of implementing the latter in the future had not been ruled out completely.

These three participants were asked which PREMIS entities were used most often in the metadata records for digital objects at their archive. Participants' responses are shown below in Table 2. A5 said both the Rights and Object Entities were used in all of the records created by her repository's staff. Additionally, her repository's staff was planning the implementation of the Agent and Event Entities within the next year. A22 said the Rights and Events Entities were always used. A29 said the current implementation plan called for the Object, Event, and Agent Entities to be used in all records but did not call for the Rights Entity to be used in any records. She said the decision not to use the Rights Entity was made because the same information was already being recorded elsewhere. Most notably, all three participants said the Event Entity was or would be implemented at their repository. Two participants reported that each of the other three entities had been or would be implemented at their repositories.

Table 2

Entities Used Most Often in PREMIS Records (Question 2A)

# of Participants	Object	Rights	Event	Agent
Implemented	1	2	1	0
Plan to Implement	1	0	2	2
Total	2	2	3	2

Next, participants were asked if any elements were always used in their repository's records. The table below shows the number of participants who said their repository required use of certain data elements or semantic units in PREMIS records for digital objects.

Table 3

Elements Always Used in PREMIS Records (Question 3A)

Element in the Object Entity				# of Participants
objectCharacteristics	format	2	formatName	2
			formatVersion	2
	fixity	3	messageDigestAlgorithm	3
			messageDigest	3
	compositionLevel			2
preservationLevel				1
objectCategory				2
objectIdentifier		2		objectIdentifierType	2
			objectIdentifierValue	2
Element in the Event Entity				
eventIdentifier				1
eventType				2
eventDateTime				2
Elements in the Agent Entity				
agentIdentifier				1
Elements in the Rights Entity				
copyrightInformation				1
Notes field containing constraints on use and rights holder				1

Then I asked these participants if any elements were never used (Question 4A) in the PREMIS records at their repository. A5 said her repository did not use a lot of the linking fields. A22 said there were "many" data elements not implemented by her repository because PREMIS was "repetitive" and "verbose." A29 reiterated that her repository did not plan to use the Rights Entity and thus would not be using any of the data elements or semantic units belonging to it.

These participants were asked if their employing repository had any formal, documented policies about how to apply PREMIS (Question 5A). One repository (A5) said yes, while one (A22) said no. The third (A29) said formal policies were currently being developed and documented as part of the implementation planning and preparation stage.

For Question 6A, I asked these participants to provide me with a sample digital object and correlating PREMIS record from their repository if possible. As stated previously in the Methodology section, these materials have not been included in this report because doing so could compromise the participants' anonymity due to the small sample size.

I also asked participants (Question 7A) if the PREMIS metadata interacted either very well or very badly with the other software already used by staff at their repository. A5 said her repository was able to implement the PREMIS semantics without a problem. She elaborated: "PREMIS metadata, to the extent we are using it for file and rights description, integrates well into our environment. We are now even more in the process of adding richer semantics for Events and Agents, and we expect that to integrate just as well." A22 said the PREMIS metadata interacted very well with the Fedora and OPAC systems already in use at her repository. A29 could not answer the question since implementation had not yet begun at her repository. However, she did say staff with programming expertise needed to build a piece onto the existing Fedora system before the PREMIS implementation could take place, and that work had not been completed at the time of the interview.

The length of time since PREMIS implementation varied greatly between the three repositories. In response to Question 8A, A5 said her repository had been using PREMIS for approximately six years, while A22 said approximately two. A29 said she and her colleagues had been planning the PREMIS implementation for four months at the time of our interview.

These participants were asked if PREMIS had fulfilled their repository's preservation metadata needs regarding digital objects. Their responses are shown in Table 4 below.

Table 4

Repository's Preservation Metadata Needs Fulfilled by PREMIS (Question 9A)

Needs Fulfilled?	# of Participants
Yes	0
No	1
Don't know yet	1
Ok so far	1

Most notably, no participants said "yes." One (A22) said "no," and one (A5) said "ok so far." A29 said that based on her employing repository's current PREMIS implementation plan, she felt like PREMIS would meet the staff's intended purpose of tracking when actions happen to the digital objects, but did not feel able to predict how well the standard would meet other preservation metadata needs. Since the PREMIS implementation had not yet taken place, I coded her response as "Don't know yet" in the table above.

With regards to Question 10A, participants identified issues with PREMIS that they felt should be addressed by its creators. A22 said they should address PREMIS' intellectual complexity and high level of detail. The other two participants (A5 and A29) reported no issues with the PREMIS data dictionary itself. None of the three participants expressed concerns about the XML schema itself.

Next these participants were asked to identify barriers to implementation that were discussed by repository's staff during the process of deciding whether or not to implement PREMIS. In total, they identified four, which are shown in Table 5 below.

Table 5

Barriers to Implementation Discussed by Repository Staff at Repositories Where

PREMIS Had Been or Was Going to be Implemented (Question 11A)

Barrier	# of Participants
PREMIS too detailed; metadata too verbose	1
Lack of or constraints of technological platform	1
Questions about return on the investment	1
Lack of automation tools	1
None	1

A22 reiterated her statement from the previous question that PREMIS' intellectual complexity was a barrier to implementation. She also cited questions about return on investment, saying that she and her colleagues discussed the possible benefits from recording information using PREMIS that is already recorded elsewhere. A29 identified a lack of automation tools and the constraints of her repository's current technological platform, which she referred to as "infrastructure," as a barrier to implementation. Additionally, she cited a lack of or the constraints of a technological platform. A5 said

her employing repository's staff did not discuss any barriers to implementation before

making the decision to implement. These findings will be discussed later in the paper.

Participants cited a total of four resources that were used during planning and

preparing to implement PREMIS at their employing repository, which are shown in Table

6 below.

Table 6

Resources Used to Prepare for PREMIS Implementation (Question 12A)

Resource	# of Participants
Documentation on the PREMIS website	3
Tutorials on website	2
Hands-on Training	2
OCLC's PREMIS report	1

All three participants said they and their colleagues used the documentation on the LOC's

webpage devoted to the PREMIS standard to prepare.[11] Additionally, two said they and

their colleagues used the tutorials available on the website. Two said they had previously

attended training at the LOC in Washington, D.C., and one of those said some of her

colleagues had attended the training also. One (A22) cited OCLC's Report on

PREMIS.[12] Version 1.0 of the data dictionary itself is contained within this report.

Participants were asked what type of support not currently in existence would

help their repository become better able to implement PREMIS. However, two of the

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[11]PREMIS Preservation Metadata Maintenance Activity website:
http://www.loc.gov/standards/premis/

[12]PREMIS Data Dictionary for Preservation Metadata. Retrieved from
http://www.oclc.org/research/activities/past/orprojects/pmwg/premis-final.pdf

four kinds of support named by the participants did currently exist to some extent at the time the interviews were conducted. First, A22 said a PREMIS profile would increase the ability of her repository's staff to implement PREMIS.   However, a few PREMIS profiles have been created. Profiles for using PREMIS within METS could be found from the LOC's website mentioned in the previous question.[13] Yale University has developed another PREMIS profile, which was also available online.[14] Second, some tools that automate the creation of PREMIS records already existed, although responses from all three participant groups show that the need for more such tools persists. For example, the digital preservation software Dark Archive in The Sunshine State (DATSS), which was created by the Florida Center for Library Automation (FCLA) automates PREMIS record creation.[15] All of the participants' responses are shown Table 7 below.

Table 7

External Support Desired (Question 13A)

Support	# of Participants
Tools that automate PREMIS record creation	1
Development of a full ontology	1
Development of a PREMIS profile	1
Development of an accompanying content standard	1

[13]PREMIS Preservation Metadata Maintenance Activity website, document for using PREMIS with METS: http://www.loc.gov/standards/premis/premis-mets.html

[14]Using PREMIS to support preservation of digital assets at Yale. Retrieved from: http://www.library.yale.edu/cataloging/metadata/pmtf/YalePREMISintro.pdf

[15]Florida Center for Library Automation (FCLA) website: http://daitss.fcla.edu/

A22 and A5 reported that an additional metadata standard was used to record preservation metadata at their repositories. One of them, A5, said this only occurred sometimes because additional non-PREMIS preservation metadata was not required in the records for all digital objects, but such metadata was preserved when the data supplier provided it. The specific standard used was different at each repository. These findings are reflected in Table 8 below.

Table 8

Metadata Standards Used to Record Preservation Metadata in Addition to PREMIS

(Question 14A)

Other Metadata Standards?	# of Participants	Specific Standard	# of Participants
Yes	2	MIX[16]	1
		METS[17]	1
No		1	

Lastly, participants were asked what actions their repository's staff had taken regarding preservation metadata before making the choice to implement PREMIS. Two participants (A22 and A29) reported that no preservation metadata was recorded at their repository previously. The other participant (A5) said preservation metadata had been previously recorded using METS.

Repositories Where PREMIS Had Not Been Implemented

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[16]MIX is an XML-based schema developed by the LOC for encoding the NISO Technical Metadata for Digital Still Images standard. http://www.loc.gov/standards/mix/

[17]"The METS schema is a standard for encoding descriptive, administrative, and structural metadata regarding objects within a digital library, expressed using XML schema language of the World Wide Web Consortium." http://www.loc.gov/standards/mets/

Forty-seven of the 50 repositories (94%) represented by the study participants said PREMIS was not currently implemented to any degree at their repository nor had the decision to implement it been made. Table 9 shows the breakdown of those 47 participants arranged by whether or not they reported discussion regarding the possibility of implementing PREMIS had taken place at their repository.

Table 9

PREMIS Implementation Discussed by Repository Staff (Question 2B)

Has PREMIS been discussed?	# of Participants	Subcategory	# of Participants
Yes	19	Decision to implement has been made	2
		Had previously implemented but since stopped	1
		Are currently discussing	2
No	28	Not heard of PREMIS before invitation to study	5

Of the participants who reported PREMIS had not been implemented at their repository, the majority, 59.57%, said implementing PREMIS had not been discussed by her repository's staff. Additionally, five of these 28 participants (17.85%) also said they personally had not heard of the standard prior to receiving my email message. However, the percentage of participants who said their repository's staff had discussed implementing PREMIS was still relatively high at 40.42%. The remainder of this section will report the findings of the questions asked to each of these two participant groups and those asked of both.

I.   *Repositories where the staff had discussed implementing PREMIS*

Nineteen participants said the staff at their repository had discussed implementing PREMIS. As seen in Table 9 above, two participants reported that their repository's staff was currently having this discussion. Two others (A25 and A50) said the decision to implement PREMIS had been made at their repository and planning was under way. However, the planning at both of these repositories was not far enough along to include the technically specific details needed to answer the question set asked of the first participant group. Notably, one participant, A42, said her repository had implemented PREMIS previously but had since chosen to discontinue using the standard. She said she was unable to provide information about the specific entities and elements used in the previous implementation because so much time had passed. However, she cited reasons for discontinuing use of the standard, which will be discussed in the next section of this paper. I determined all of these participants were best suited to answer the set of questions for those who had not implemented PREMIS but had discussed the possibility.

The interviewees who reported discussion had taken place were then asked what potential barriers to implementing PREMIS had been or were being discussed by staff at their repository, and they cited a total of 15 different barriers, which are shown in Table 10 below. Most participants cited multiple barriers.

Table 10

Barriers to Implementing PREMIS Discussed or Being Discussed by

Repository Staff (Question 3B)

Barrier	# of Participants
Lack of staff time/manpower	7
Lack of/constraints of technological platform or support	5
Lack of institutional support	5
PREMIS too detailed; metadata is too verbose	4
Repository lacks a preservation policy and program	3
Lack of PREMIS support/training available	2
Monetary expense to repository	2
Questions about return on investment	2
Lack of programming/technical knowledge or support	2
How to integrate PREMIS metadata creation into repository's existing workflow	2
Length of implementation time	1
Repository's staff resistant to change	1
PREMIS is more library than archive focused	1
Constraints of consortia	1
PREMIS lacks a minimal core set of elements	1

The most cited barrier was a lack of staff time and manpower, which was reported by seven interviewees. Five participants each cited a lack of or the constraints of the technological platform at the repository and a lack of institutional support for PREMIS implementation, making them tied for the second most cited barrier.

Only four of the barriers cited were "external barriers" to PREMIS implementation at repositories, which was interpreted to mean they were directly related to PREMIS, either the standard itself or the available resources about PREMIS. All the external barriers combined were cited by a total of only eight participants. Four participants said PREMIS was too detailed and therefore created verbose metadata, making it the most cited external barrier.

The other 12 barriers cited were related to the administrative structures and circumstances at the individual repositories themselves, including the three most cited barriers. Such barriers were "internal." All of the internal barriers combined were cited a total of 31 times. The significance of the findings regarding external versus internal barriers to implementation will be discussed later in this paper.

When participants were asked to identify the largest reason staff at her employing repository chose not to implement PREMIS, they cited twelve different reasons, which are shown in Table 11 below.

Table 11

Biggest Reason Repository Staff Decided Not to Implement PREMIS

(Question 4B)

Reason	# of Participants
Lack of staff time/manpower at repository	4
Lack of institutional support	3
Lack of/constraints of technological platform at repository	2
Expense to train staff	2
Lack of programming/technical knowledge or support at repository	2
PREMIS too detailed; metadata is too verbose	1
How to integrate PREMIS metadata creation into the existing workflow	1
Monetary expense to repository	1
Repository staff resistant to change	1
PREMIS lacks a minimal core set of elements	1
Length of implementation time at repository	1
Didn't interact well with the archival systems available	1

Four interviewees cited lack of staff and manpower as the most important barrier to PREMIS implementation. Three participants cited lack of institutional support as being a very important barrier. Three other barriers were cited by two participants each, while the other seven barriers were cited by only one participant each.

Since participant A42 was unable to answer these two previous questions, she reported the barriers that her repository's staff had encountered during their PREMIS implementation, which caused them to stop using the standard.

II.   *Repositories where the staff had not discussed implementing PREMIS*

Thirteen of the participants, who said PREMIS had not been implemented at their

repository and the staff had not discussed the possibility of doing so, voluntarily shared

with me the barriers to implementing all metadata standards in the description of digital

objects faced by their repository's staff. Participants reported a total of seven barriers,

which are listed in Table 12 below. All of the barriers identified were also identified by

both of the other participant groups and all were internal.

Table 12

Barriers to Implementing All Metadata Standards in the Description of Digital

Objects

Barrier	# of Participants
Lack of staff time/manpower at repository	6
Lack of programming/technical knowledge or support at repository	2
Lack of institutional support	5
Monetary expense to repository	1
Lack of automating tools	1
Lack of preservation policy and/or program at repository	1

III.   *Questions Common To Both*

All of the participants representing repositories where PREMIS had been

implemented were asked if their repository currently had a policy of assigning any

preservation metadata to its digital objects. The results are shown in Table 13.

Table 13

Whether or Not Preservation Metadata Was Assigned to Repository's Digital

Objects (Question 5B)

Assign preservation metadata?	# of Participants
Yes	24
No	21
Sometimes	2

Over half of participants (51.06%) said "yes." However, a substantial amount,

44.68%, said "no." One said preservation metadata is assigned to some but not all of

their repository's digital objects. This response was coded as "sometimes" in the table

above.

Twelve of the 24 interviewees (50%) said the preservation metadata assigned to

the digital objects at their employing repository consisted only of technical metadata,

such as digital reproduction information. Five other interviewees said technical and

rights metadata were the only kinds of preservation metadata recorded at their repository.

This is shown in Table 14 below.

Table 14

Specific Kinds of Preservation Metadata Being Recorded at Repository

Kind of Preservation Metadata	# of Participants
Only Technical Metadata	12
Only Technical and Rights Metadata	5

When asked if there was any specific type of external support not in existence that

would help their repository become better able to implement PREMIS, interviewees

suggested ten different kinds of support. The number of participants requesting each kind

of support is shown in Table 15 below.

Table 15

External Support Desired (Question 6B)

Support	# of Participants	Sub-category	# of Participants	Sub-category	# of Participants
Tools that automate PREMIS record creation	13	PREMIS metadata creation incorp-orated into existing software programs	5	Archon	3
				Archivist Toolkit	3
		Extraction tool	1		
		Mapping	2		
Don't know	8				
No	4				
Not applicable	4				
Hands-on training	6	Regional	2		
		Online free	1		
Document on how to integrate PREMIS with ContentDM	3				
Scenarios of possible implementations or different degrees of implementation	2	For small repositories	1		
Live person support online	2				
More outreach because many people are still unaware of it	2				

Improve/create more tutorials	2				
Document containing cases for how to convince repository administration	1				
Web resource that provides information about available automation tools	1				
Document on how to integrate PREMIS with existing Dublin Core records	1				

The most popular suggestion, recommended by thirteen participants, was the creation of tools that help with implementation through automation. Five participants said having PREMIS folded into existing software packages would be a great help to repositories. Three cited both Archivist Toolkit and Archon specifically. They illustrated the desired functionality by explaining how Archon and Archivist Toolkit generated EAD with the click of a button. One participant (A50) said she and her colleagues were considering using Dark Archive in The Sunshine State (DATSS), which was digital preservation software created by the Florida Center for Library Automation (FCLA).[18] This software transforms SIPs into AIPs and then maps them to PREMIS.

Two other kinds of automation tools were suggested. One participant (A10) said a tool that extracted metadata and then converted it into the PREMIS data elements and XML schema would help repositories. Two participants (A37 and A42) suggested tools to map between PREMIS and other standards.

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[18]Florida Center for Library Automation (FCLA) website: http://daitss.fcla.edu/

Several interviewees had related suggestions. One interviewee (A24) recommended the PREMIS Working Group or another professional organization should create a web resource to provide information about available automation tools and their advantages and disadvantages. Two others said they wanted documentation on how to integrate PREMIS with existing software programs.

Six interviewees said the PREMIS Working Group should provide more hands on training, and two of those interviewees stressed that the training should be regional because sending staff to trainings in Washington, D.C. at the LOC is cost prohibitive for smaller repositories and those in the western part of the country. Four interviewees said they wanted a professional group to create guidelines for different levels of implementation.

Eight participants said they were unsure whether or not additional support would help their repository's staff become better able to implement PREMIS. Four participants said they did not think any additional support would help their repository. This question was not applicable to another four because they were uninformed about the PREMIS standard itself and/or the information and resources currently available.

Then these interviewees were asked if their repository's preservation metadata needs were currently being met. Almost half of the participants, 23 of the 47, said "no," making it the most common answer by far. Nine participants said "yes." Eight participants said "partially," and three of those explained that the necessary information was being collected at their repository, but it might become unusable in the future because of the way it was being recorded. Six participants responded that they did not know how well their repository's preservation metadata needs were currently being met

and then after a moment of reflection said "ok so far." One participant said "probably

not."

Table 16

Whether or Not Repository's Preservation Metadata Needs Are Currently Fulfilled (Question 7B)

Needs Fulfilled?	# of Participants
Yes	9
No	23
Don't Know/Ok So Far	6
Probably Not	1
Partially	8

Finally, participants were asked to predict the degree of likelihood that their

repository's staff might consider or reconsider implementing PREMIS in the future.

Their responses are shown in Table 17.

Table 17

Likelihood Repository Will Consider or Reconsider Implementing PREMIS in the Future (Question 8B)

Likelihood	# of Participants
Likely	24
Somewhat likely	6
Not likely	8
Very likely	3
Certain	2
Not applicable	4

Most interviewees, 24, said they thought it was "likely." The second most

common response, which was cited by eight participants, was "not likely." Two

participants said a digital preservation policy and program were currently being established at their repositories, so it was "certain" their staff would consider implementing PREMIS as part of that process. Four participants did not answer this question because they were currently discussing whether or not to implement PREMIS. I coded these participants as "Not applicable" in the table above. Additionally, eight interviewees also said staff at their repository was waiting for a specific circumstance or barrier to change before PREMIS could be implemented.

The conclusions drawn from these findings will be discussed in the next section of this paper.

Discussion

Repositories Where PREMIS Had Been Implemented or a Detailed Implementation

Plan Had Been Developed

Only three participants out of the whole sample population of 50 reported that

PREMIS had been implemented at their repository or a detailed implementation plan had

been developed. While these participants' responses provided a useful glimpse at how

PREMIS has and is being implemented at American archives, the sample size for this

group was too small to draw definite conclusions and generalize them to the whole

population of American archives where PREMIS had been implemented or a plan to do

so developed. In this section of the paper, I will elaborate on the statements made by

these participants and the possible meanings they suggest.

The participants' responses to Question 1A revealed that all three repositories

were committed to using the elements from the PDD, but only one was committed to

using the accompanying XML schema (see Table 1). The PREMIS Working Group

developed the XML schema(s) in hopes of making implementation of the PDD, which

was their main goal, easier for repositories. In the LOC commissioned report,

Implementing the PREMIS Data Dictionary: A Survey of Approaches, Sally H.

McCallum, Chief of the LOC Network Development/MARC Standards Office, said the

PDD was released with the XML schemas to "support its implementation" (Woodyard-

Robinson, 2007, p. 5). Later in the report, Woodyard-Robinson, who was a member of

the PREMIS Working Group, explained that storing preservation metadata in XML

structures was observed to be a general trend among cultural heritage institutions in the

group's first report[19] (2007, p.10). Informed by the conclusions of the earlier report, it

makes sense the members of the PREMIS Working Group would believe that the

availability of an XML schema might encourage adoption of the PDD itself.

The current study, however, showed that the availability of an accompanying

encoding schema did not have a substantial impact on staff members' decisions to

implement the PDD. Rather, the lack of institutional commitment to the XML schema

these participants reported may suggest the schema is not needed at many repositories

perhaps because the staff instead chose to incorporate the data elements into the encoding

standard already being used. For example, A5 reported that her repository's staff chose

to use the PREMIS data elements within the METS encoding schema that was already

used.   A22 also said her repository's staff chose to incorporate the PREMIS data

elements into the currently used encoding schema instead of the PREMIS schema. These

responses implied that the staff at their repositories deemed this incorporation of the data

elements into the current schema would be more efficient than developing a new

workflow to encode the elements in the PREMIS XML schema going forward.

The interviews revealed that two out of three repositories were using or planning

to use each entity represented (see Table 2). This suggested that repositories' specific

needs varied, and therefore, the particular entities used varied accordingly. At least one

repository found data elements from each of the entities to be useful. In Question 3A, the

participants were asked to identify which elements were always used in PREMIS records

at their repository (see Table 3). Participants identified four elements belonging to the

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[19]Implementing Preservation Repositories For Digital Materials: Current Practice And
Emerging Trends In The Cultural Heritage Community by the PREMIS Working Group,
September 2004
http://www.oclc.org/research/activities/past/orprojects/pmwg/surveyreport.pdf

Object Entity, which was more than for any other entity. Additionally, the Object Entity

was the only entity for which participants cited element qualifiers. Participants cited

three or fewer elements and no element qualifiers from each of the other three entities.

Even though these numbers were not far behind the number of cited elements belonging

to the Object Entity, they suggested that these repositories had or intended to implement

the Event, Rights, and Agent Entities to a lesser degree. By contrast, these participants'

repositories had or intended to implement the Object Entity in more detail and to a

greater degree overall than the other three entities. This may suggest that the staff at these

repositories determined more data elements needed to be used from the Object Entity in

order for the information recorded to be truly useful for their purposes.

The responses to Question 4A showed that the staff at these repositories had

decided not to use some specific data elements in any of their records, although which

ones varied by repository. A22 stated that PREMIS' repetitive nature and verbosity

resulted in the staff at her repository deciding not to use "many" data elements. Later in

Question 11A, this participant cited the intellectual complexity of PREMIS as a barrier to

implementation that her repository's staff had discussed. PREMIS is a highly detailed

and sometimes repetitive standard because it is intellectually complicated. Therefore, the

decision by this repository's administration not to use many elements seemed to be a

tangible result of the standard's intellectual complexity. A5 said her repository had not

used many of the linking fields. This suggested that either the repository's staff did not

often need to document the relationships represented by such elements or that they had

another way of documenting those relationships.

In response to Question 5A, two of the three participants said their repository had

or was developing formal policies on how to apply PREMIS. I had expected all of the

repositories that had implemented PREMIS to have developed formal policies governing

its application during the pre-implementation planning process because such planning

fosters efficiency and prevents the introduction of inconsistencies when the work is done

by various staff members. Additionally, documenting formal processes is crucial to

sustaining any project long term because the information contained in such documents

will be needed in order for new staff to continue the work after those who originally

developed the processes have left the repository. A29 expressed that her repository had

developed such documentation, which was in line with my expectations. A5, which had

been implementing PREMIS ever since the first version, said her repository had created a

document stating which elements are required for the two entities already implemented.

Since she and colleagues were planning to implement the other two entities within the

next year, I suspect similar documentation will be created for those entities as well. I was

surprised that her repository did not have more documentation of the actual workflow

processes involved in creating PREMIS records. However, the third participant's

comments strayed more from my expectations; A22 said that her repository had no

formally documented processes even though the staff had used the PREMIS' data

elements for approximately two years prior to the interview. During that amount of time,

some specific, and probably refined, processes should have developed organically, even

if none were put in place purposefully, which could have been documented. The

participant made another comment that suggested her repository's staff wanted to

develop formal documentation and was moving in that direction; she said that recently a student had helped develop a profile of what PREMIS might mean in their specific case.

In response to Question 7A, A5 reported that implementing the PREMIS data elements into the software at her repository had caused no problems so far. She expected this to hold true during the upcoming implementation of two additional entities. The statements of the other two participants seemed to contradict each other. A22 said the PREMIS metadata had interacted very well with the Fedora system in place at her repository. A29 could not answer the question as asked because PREMIS implementation had not yet occurred at her repository, but she reported that as part of the preparation, staff with programming expertise needed to build an additional piece of software onto her repository's Fedora system in order to prevent negative interactions.

For A29's repository, the PREMIS implementation required significant amounts of staff time and programming expertise up front to in order to use the data elements in the existing content management system. This example illustrated how implementing standards such as PREMIS can require a lot of initial investment from repositories. Another option would be for a repository's staff to migrate from their current content management system to another one they determine will interact well with PREMIS straight out of the box. Unfortunately, this option can also require a large amount of up-front investment; while the need to create customizations to a current system is eliminated, other resources must be expended to complete the migration between systems. For example, purchasing a new content management system will cost money, and using open source software often has large personnel costs. Additionally, metadata in the current system may need to be prepared in some way before it can be ingested into

the new repository. These possible preparation activities, such as mapping and clean-up, require staff time and expertise. More staff time would also be needed to design an implementation workflow and plan. Additionally, depending on how many resources were invested in establishing the current system, how long that system has been in use, and how well it accommodates the needs of the repository's digital collections, staff may resist migrating content and associated metadata to a new system because of these prior investments.

In response to Question 11A, A29 cited the constraints of her repository's technological platform as a barrier to implementation her repository's staff discussed. Her responses to Questions 7A and 11A suggested that the amount of initial investment required to implement PREMIS was a substantial consideration for her repository's staff. When asked about barriers to implementation in Question 3B, the responses of some participants belonging to the two other groups also supported this assertion that the effects of technological infrastructure and its associated costs are important in the repository staff's decision making. For example, A2 said it was not likely his or her repository's staff would reconsider implementing PREMIS or any other substantial changes for a long time because of the investment they had already made in their current system (Question 8B).

In Question 8A, each of the three participants provided very different answers when asked the length of time since implementation. A5 reported that the staff at her repository had implemented PREMIS approximately a year after the first version of it was released. A22 responded that approximately two years had passed since implementation at her repository. While this is a notable length of time, it is much

shorter than the length of time A5's repository implemented PREMIS and the length of time the standard has existed. A29's response was on the completely opposite end of the spectrum from that of A5; she reported that his or her repository's staff had been planning their specific PREMIS implementation for less than a year. These answers demonstrated that administration and staff at two of the three repositories represented had been relatively slow to implement PREMIS. Because of this finding and the finding that 94% of all study participants reported their repository's staff had not implemented PREMIS, a slow rate of implementation similar to the one demonstrated by this study is likely to be the case among the whole population of U.S. archives.

In Question 9A, the participants were asked if PREMIS had fulfilled their repository's preservation metadata needs (Table 4). It is notable that no participant was able to definitively say yes. One of these participants, A29, could not answer the question as it was asked since her repository had not yet implemented PREMIS. However, A29 said that based on her employing repository's current PREMIS implementation plan, she felt like PREMIS would meet the staff's intended purpose of tracking when actions happen to the digital objects but did not feel able to predict how well the standard would meet other preservation metadata needs. This statement showed that A29 felt confident PREMIS would meet one of the preservation metadata needs identified by repository staff, but uncertainty remained regarding the standard's ability to meet other identified needs. A5 said, "it is meeting our management needs so far." She also said it provided them with a "certain amount of security," and she felt "it's easy to apply." Interestingly, this participant's comments expressed an overall sense of happiness with PREMIS even though she still showed some insecurity regarding the

standard's ability to meet her repository's preservation metadata needs. A5's repository's staff had implemented PREMIS in 2006, which is longer than at any other repository represented by the survey participants. As previously stated, the staff at this repository had also implemented the standard to a greater degree than all other repositories represented by study participants. Therefore, it is notable that some uncertainty still remained in A5's mind after such a large amount of time and investment into PREMIS.

When the third participant (A22) was asked how PREMIS had met her repository's preservation metadata needs, she said, "Not very well; it overwhelms us." This statement was related to four others she made about the intellectual complexity of PREMIS. This participant attributed the decision not to implement many data elements to the extensive level of detail and complexity present in the standard and identified this as an issue the standard's creators should address. Additionally, she identified it both as a barrier and as one of the largest barriers to implementation discussed by her repository's staff. These responses were to Questions 5A, 10A, 11A, and 12A respectively. In light of this participant's other responses, her response to Question 9A implied that PREMIS' complexity was inhibiting the standard's ability to meet the preservation metadata needs at her repository.

In response to Question 10A, the other two participants identified no issues with the PDD itself. No participants expressed criticism of the XML schema itself. One of the participants who identified no issues, A29, commented that repositories need tools to automate the creation of PREMIS records. This comment implied that automation tools would increase efficiency and total output, which would in turn decrease the amount of staff time required for such tasks, thereby making the staff at repositories more able to

implement PREMIS. This comment was consistent with her later response to Question 13A, where she cited automation tools as a specific type of support that she believed would help her repository's staff become better able to implement PREMIS.   She said that most of the information available about the standard was either very basic or very technical, with little existing to help those in between these two extremes.   Participants belonging to all three categories requested automation tools as a type of additional support.

In Question 11A, participants were asked to identify barriers to implementation that were discussed by staff at their repositories. A5 said the staff at her employing repository had not discussed any barriers to implementation before committing to it, which implied that her repository's staff felt they had enough resources to reasonably implement and sustain the standard without intolerable negative consequences. A5's comment is significant because every other participant in the entire sample population cited at least one barrier. Both of the other participants in this category cited two barriers each, one an internal and the other an external

When asked what resources their repository's staff used to prepare for their PREMIS implementation, participants identified solely resources created by or made available by the LOC or some division of it, which is the authoritative body that developed and still maintains PREMIS. The three resources cited were the documentation on the LOC's webpage devoted to the PREMIS standard[20], the tutorials

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[20]PREMIS Preservation Metadata Maintenance Activity website: http://www.loc.gov/standards/premis/

also located on the website, and the PREMIS Data Dictionary for Preservation

Metadata.[21]

Participants identified four kinds of external support they desired. Only one

participant cited each kind of support. The question asked participants to identify support

that was not currently in existence, but two out of the four kinds of support they cited

already existed to some extent when the interviews were conducted. This suggested that

more publicity is needed to let people know of the about the available support and

resources. Dark Archive in The Sunshine State (DATSS) is digital preservation software

created by the Florida Center for Library Automation (FCLA)[22] that allows staff to

generate PREMIS metadata with the click of a mouse, and therefore the staff does not

need technical knowledge about the standard.

When asked if their repository's staff used additional metadata standards to record

preservation metadata, two of the participants reported that that they also used METS.

One of these, A5, said METS was used to express the structural metadata needed for

accurate rendering of objects. The other, A22, said the technical metadata that arrives

with the SIP upon ingest is recorded in METS. The third participant said no standards

besides PREMIS were used for this purpose at her repository.

Lastly, participants were asked if staff at their repository had recorded

preservation metadata prior to the PREMIS implementation. Two participants (A22 and

A29) reported that staff at their repositories had not recorded preservation metadata

previously, which suggested that PREMIS fulfilled a previously unmet need for these two

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[21]PREMIS Data Dictionary for Preservation Metadata. Retrieved from
http://www.oclc.org/research/activities/past/orprojects/pmwg/premis-final.pdf

[22]Florida Center for Library Automation (FCLA) website: http://daitss.fcla.edu/

repositories. The other participant (A5) said her repository's staff had previously recorded preservation metadata using METS. After implementing PREMIS, the structural metadata mentioned above was the only preservation metadata that they chose to continue recording in METS.

Repositories Where PREMIS Had Not Been Implemented

Forty-seven out of 50, or 94% of, participants reported that their repository's staff had not implemented PREMIS. Nineteen or 40.42%, of these participants reported that their repository's staff had discussed PREMIS. The other 59.57%, or 28, of these participants said their repository's staff had not discussed implementing PREMIS. The remainder of this section will discuss the findings from both of these groups respectively.

I.   *Repositories where the staff had discussed implementing PREMIS*

Nineteen participants from the entire sample population reported that the staff at their repositories had discussed implementing PREMIS. While this was fewer than half of all the participants who reported no PREMIS implementation at their repository, it still demonstrated that a relatively high level of interest in PREMIS existed among the repositories represented. Two participants reported that their repository's staff having ongoing discussions about a possible PREMIS implementation at the time of their interviews. Two others (A25 and A50) said the staff at their repositories had chosen to implement PREMIS and had begun the planning process.

In response to Question 3B, seven of these 18 participants, or 38.8%, cited the lack of staff time and manpower at their repository as a discussed barrier to implementation. Therefore, it was the most cited barrier. A18 said the amount of staff at her repository had been reduced by between 30% and 40% in the last year. Additionally,

this participant said a hiring freeze had been in place at her repository, which meant the many recent retirements could not be filled. She noted that the staffing shortage would likely prevent the current staff from receiving additional training. She said that as a result, she felt like her repository was "frozen" and unable to move either forwards or backwards. The significance of staff time and manpower among the whole sample population will be discussed later.

Five of the 18 participants, or 26.3%, cited each the lack of or constraints of the technological platform and a lack of institutional support as barriers to implementation. Therefore, they were both cited second most frequently. Although many participants identified the lack of or technological constraints of their system as a barrier to implementation, the interviews also revealed that some of those participants and their colleagues were taking steps to decrease this barrier. A40 explained the situation at her repository by saying the current system did not have capabilities for storing and keeping up with preservation metadata. She then added that her repository was moving to a Fedora environment soon, which would have the ability to capture more of that metadata. A24 reported that her repository was in the process of switching to a Medusa system, which would make it more likely for staff at her repository to reconsider implementing PREMIS in the future. A35 reported that her repository was in the process of moving to a system that would run and record checksums, which had not been done previously. These actions signaled that the repositories' staff are making efforts to become better able to create and manage metadata for their digital objects.

The interviews revealed that a lack of institutional support was also an important barrier to implementation at the repositories. Multiple participants stated that their

repository's administration was focused on access, often at the expense of long-term preservation measures. A40 said digitizing for access was a primary goal of her repository's and departmental administration, and it overshadowed digital preservation. She described her predicament by saying, "until you start losing things, it's hard to convince people." A25 echoed this sentiment when she said it felt like nothing got done until something bad happened. A17 said her repository's administration wanted the greatest number of products possible, and therefore was only secondarily concerned about the long term health of the digital objects. Since long term preservation was lower in priority for these administrators, they did not feel there was a great need to record metadata intended for this purpose. She and colleagues coped with the lack of institutional support for preservation metadata by trying to strike a balance between producing digital objects and ensuring they can be built on for the future. A50 said "[we are a] production oriented group, so it is important that whatever we add to our workflow does not become a burden because we have to be pumping out new digital resources all the time."

A31 said she, her colleagues, and administration had been thinking about digital assets largely but not solely in terms of access. This viewpoint caused them to look at simpler metadata because they would be easier to implement. These findings suggested that when providing access to digital objects became the main focus at a repository, the long term preservation of those objects was more likely to be overlooked and suffer from benign neglect as a result.

Two participants cited a lack of programming or technical knowledge and/or support. A40 said she and her colleagues had to regularly educate their organization's IT

staff on the need to record preservation metadata. She said they did not understand the

need to record such metadata because it is embedded in the files, and therefore she had to

explain why each piece of metadata must be in a discrete field. These comments

reflecting the communication and knowledge divide between archivists and IT

professionals are not surprising when you consider that each group received very

different training, and even the word "archive" carries a different meaning within each

group. A25 commented that she felt "fortunate" to work within a science and

engineering research library because many employees possessed the needed

technological expertise and it was therefore readily available. This comment recognized

how precious such technical knowledge is at many repositories and the challenges staff

face without it.

Four participants cited PREMIS' high level of detail and complexity as a barrier

to implementation. A40 elaborated on the frustration this caused by saying that PREMIS

"comes off sounding a lot simpler" in presentations "than [when] implementing it with

your collections." Additionally, she described the standard as "intimidating." These

comments in conjunction with those in the previous paragraph suggested that the

difficulty presented by PREMIS' complexity was increased at repositories where the

level of technical and programming expertise was low or unavailable.

A significant discovery was that one of these participants, A42, reported that her

repository's staff had previously implemented the standard but since discontinued its use.

She was unable to provide information about the specific entities and elements used

during the previous implementation stating that much time had passed since, but she

instead reported the reasons why use of the standard had been discontinued. First, she

said the constraints of their digital repository system had created difficulty. She elaborated by saying her repository's staff had used various PREMIS data elements within a METS encoding schema, which had created a lot of work and "introduced bottlenecks."

Secondly, A42 cited a lack of staff time and manpower as contributing factors to the decision to discontinue using PREMIS. She said, "the overhead of maintaining METS and PREMIS to its current and latest and greatest form was significant." Because of staffing reductions, her repository's administration was unable to dedicate one position to maintaining that metadata over time. Therefore, the repository's administration and staff was faced with justifying spending resources to create metadata they did not currently have the resources to sustain long-term. She said that ultimately this caused them to decide that continuing to use PREMIS was not necessarily the best use of their resources. She said they believed the problem of sustainability was exacerbated by the fact that PREMIS was still evolving and being revised. In response to Question 3B, five and seven of the 18 participants respectively also cited both of these barriers, the constraints of their system and lack of staff time and manpower, which prevented continued implementation at A42's repository.

A42 answered an altered version of Question 4B, saying that the most important reason her repository's staff chose to discontinue using PREMIS was the standard's "verbosity." She illustrated the amount of work involved in creating metadata for digital objects when using PREMIS by saying it took approximately 20 lines to express what they record in one line of their current schema. This finding was interesting because A42 did not explicitly cite the verbosity of PREMIS as a barrier encountered in response to

the previous question. However, in light of A42's answer to the latter question, her previous statements that the amount of work increased greatly and bottlenecks began occurring in the workflow after PREMIS implementation took place seem to suggest that PREMIS' high level of detail was the cause.

The three most cited barriers were internal. Participants cited all of the internal barriers, which were defined as those directly related to PREMIS, a total of 31 times, with many participants citing multiple barriers. By comparison, all of the external barriers, which were defined as those directly related to PREMIS, were cited a total of 10 times. These findings support the assertion that internal barriers were of more concern to these participants than external ones overall.

These internal barriers are frequently present at many other repositories across this nation not represented in this study. Therefore, such barriers may be largely responsible for preventing the implementation of standards, such as PREMIS, as well as metadata creation for digital objects in general at many repositories.

II.   *Repositories where the staff had not discussed implementing PREMIS*

Twenty-eight participants, or 56% of the entire participant population, had not implemented or discussed implementing PREMIS. Thirteen of these participants voluntarily described the barriers to implementing all metadata standards they faced in the description of digital objects. Just as with the repositories where PREMIS had been discussed, the lack of staff time and manpower was cited most frequently. Lack of institutional support was again second. Lack of programming or technical knowledge or support was the third most cited barrier among this group and was tied for the second most common among the previous group. All of these findings support the conclusion

that these three internal barriers had the greatest influence on the staff that decided against PREMIS implementation. Therefore, these same three barriers are likely to be substantial at approximately half of the archives across the U.S.

> ### III. *Questions common to both groups who reported PREMIS had not been implemented*

The findings from four questions asked to both groups of participants who reported that their repository's staff had not implemented PREMIS were significant.

First, over half of the 47 participants said their repository's staff routinely assigned preservation metadata to digital objects, which suggested that staff at many repositories had recognized the need for and importance of preservation metadata. However, further probing led to the discovery that this recorded preservation metadata consisted only of technical metadata, such as information about the digitization of objects, for half of those participants (12 out of 24). Another 5 of the 24 participants said the preservation metadata recorded at their repository consisted only of technical and rights metadata. While it is good these kinds of preservation metadata are being recorded since they aid in maintaining the resource over time, other kinds of preservation metadata need to be recorded to support longevity as well. Therefore, these findings suggested that repositories' staff and administrations were recognizing the need for preservation metadata and trying to capture this information, which was a step in the right direction. However, they also identified that the need for other preservation metadata often remained unfulfilled, which suggested that more outreach and training about preservation metadata for digital archives is needed.

Second, participants were asked to cite any external support that would make it easier for archives to implement PREMIS. Twenty eight percent of these participants cited tools to automate PREMIS record creation, which demonstrated that it was the most desired kind of support among them. Additionally, participants provided more specific suggestions related to the desired tool functionality, such as extraction, mapping, and generation within existing software programs. As stated in the findings section of this paper, three participants suggested this functionality be added into each Archon and Archivist Toolkit. Such functionality would mean that staff could use the software and generate the desired product, metadata records that use the PREMIS standard, without needing to first learn the PREMIS standard itself. This would help enable repositories' staff to implement PREMIS by lessening the overall amount of staff time, technical expertise, and money needed for implementation. Less staff time and money would need to be spent on training. Automation would decrease the overall amount of staff time needed for metadata creation, which by extension would save money, making implementation more feasible.

Participants answered second most frequently that they could not think of any external support that would help archives' staff become better able to implement PREMIS. This finding may suggest that external support would not help the staff at all repositories become better able to implement PREMIS, particularly if their main barriers to implementation are internal and can only be solved from within. Additionally, it may also suggest that these participants are uncertain of their repository's needs.

In-person training was the third most popular recommendation. Two participants specifically mentioned the desire for training to be offered on a more regional basis. A32

expressed hope that regional training might not only educate staff about PREMIS but might also have the unexpected benefit of persuading administrators to give their support to PREMIS implementation. Participants also expressed a desire for local agencies to weigh in on PREMIS. A11 said her repository's staff followed the guidelines created by a state organization for the digitization they do in-house. She expressed the desire for those guidelines to be updated to include the organization's recommendations about how to best implement PREMIS. Additionally, one participant requested some PREMIS training be presented freely-available online. This recommendation would overcome the obstacles of geography and monetary expense and minimize the amount of staff time required.

Third, both groups of participants were asked if their repository's preservation metadata needs were currently being met. Most notably, almost half of the participants, 48.93%, said they did not think the preservation metadata needs at their repository were currently being met. This suggested that the digital objects at many repositories are at risk of loss due to lack of adequate preservation metadata. One of these, A33, said "I would feel more comfortable saying they are met if we implemented [PREMIS]," which implied that she believed PREMIS would help her and colleagues fulfill the preservation metadata needs of their digital objects. The rest of the participants' responses were divided fairly evenly into three categories containing approximately 18% each. Nine interviewees said their repository's preservation metadata needs were being met. Another eight participants said "partially" and indicated that some of their preservation metadata needs were being met but that they were still trying to fulfill others. Only one participant, A8, said "probably not" and added that there is "always something more or

better you can do." A total of seven participants, those who said they did not know and the one who said probably not, expressed uncertainty when judging how well these needs were being met. Additionally, two of the three participants who said the staff at their employing repository had not implemented PREMIS expressed this same uncertainty. One of the participants who said "yes," A28, explained that the reason for her answer was "because no one has said otherwise," which suggested she likely felt some uncertainty in her own judgment. Therefore, 14.89% of the entire sample population had difficulty assessing the preservation metadata needs of their repository's digital objects. This percentage is significant since the inability to judge a repository's preservation metadata needs is yet another barrier to meeting those needs.

One interesting finding was that A7 said her repository's preservation metadata needs were being met even though in Question 5B she had said that her repository's staff did not assign preservation metadata to their digital objects. I thought these two statements to be inconsistent and therefore confusing; it should not be possible for a repository's staff to fulfill the preservation needs of their digital collections without creating any preservation metadata for their objects. After reviewing the other information provided by the participant, a possible reason for the seemingly contradictory responses became clear. This participant was one of those who had not heard of PREMIS before my invitation to participate in the study. Therefore, perhaps she and her colleagues might not be fully aware of their repository's preservation metadata needs.

A4, who worked at a repository with 1.75 FTE, said she had tried to overcome the obstacles of lack of staff time and manpower in order to meet as many of her repository's preservation metadata needs as possible by partnering with larger repositories. This

response showed an example of how a repository's staff was sometimes able to find ways of circumventing obstacles and improving their situation.

Lastly, these participants were asked the likelihood their repository would consider or reconsider implementing PREMIS in the future. Significantly, thirteen participants identified specific circumstances that would have to change before PREMIS implementation could take place at their repository. Most often these were internal circumstances they had cited as barriers in Questions 3B and 4B. Two participants indentified specific changes that had recently occurred at their repositories and elaborated on why those changes made it likely or somewhat likely they and colleagues would consider or reconsider PREMIS in the future. For example, A34 said new administration had taken charge of her repository in the last year and a half, and they agreed with her that preservation metadata is important, which was not the case with the previous administration. This shift in administration and the aligning of attitudes towards preservation metadata, made it possible for her and her colleagues to investigate how PREMIS could help them. However, there was one exception where a participant said an external barrier would need to be eliminated before implementation would be possible; A23 said that her repository's staff would not be likely to consider implementing PREMIS until "turnkey systems," by which she meant content management systems with the functionality to generate PREMIS records, existed. With the exception of A23's responses, these findings reinforced my earlier speculation that internal barriers frequently inhibited PREMIS implementation at the represented repositories. Additionally, they supported my speculation that the feasibility of PREMIS implementation would increase as these barriers are removed or lessened.

Conclusions Related to All Participants

Even though some of the survey questions differed between the group of participants who reported PREMIS had been implemented and the group who reported it had not, some conclusions that relate to all participants can be drawn on three topics. The related findings from all three groups are more meaningful when viewed together.

First, participants who reported PREMIS had been implemented were asked to identify potential barriers to implementation that their repository's staff had discussed when deciding whether or not to implement PREMIS. The second group of participants, who said their repositories' staff had discussed implementing PREMIS but had decided not to, answered this same question. Additionally, they identified the biggest reason their archive chose not to implement PREMIS. The third group of participants, who reported that their repositories' staff had not discussed a possible PREMIS implementation, obviously could not answer either of these questions. However, thirteen of the last group reported barriers to creating metadata for digital objects and to implementing metadata standards in general. These unsolicited findings reflected the same issues as those addressed by the previously mentioned questions but at a higher level. Since these higher level findings cannot be generalized to all American archives and historical societies, they are most meaningful when viewed within this comparative context.

Table 18. Barriers to Implementation Identified by All Participants

Barrier to Implementation	PREMIS	Metadata Standards in General	Total
Lack of staff time/manpower at repository	7	6	13
Lack of institutional support	5	5	10
Lack of/constraints of technological platform	5	0	5
Lack of programming or technical knowledge or support	6	2	8
PREMIS too detailed; metadata too verbose	4	n/a	4
Lack of PREMIS support/training available	2	n/a	2
Questions about return on investment	2	0	2
PREMIS lacks a minimal core set of elements	1	0	1
Monetary expense	2	1	3
How to integrate PREMIS metadata creation into repository's existing workflow	2	0	2
Lack of preservation policy and/or program	3	1	4
Constraints of consortia	1	0	1
Metadata created by vendor	1	0	1
Length of implementation time at repository	1	0	1
Repository's staff resistant to change	1	0	1
PREMIS is more library than archive focused	1	0	1
Lack of automating tools	0	1	1

The interviews revealed that lone arrangers not only had to overcome the obstacle of lack of staff time and manpower to a greater degree when trying to implement new standards than staff at larger repositories, but they also had more difficulty assessing the work that needed to be done. Since they had no colleagues to consult, they alone had to bear the whole burden of researching and deliberating. This would require much of the archivist's time, which was already a scarce resource. Additionally, it may be harder for lone rangers to justify the investment of resources needed to implement new standards, workflows, and products because they must make their case singlehandedly and convince the administration to trust their professional opinion. A15, whose archives had 2 FTE, said "the closest knowledgeable person to ask for help is three hours away," so she and her colleague are mostly unaware of emerging standards and professional trends unless they learn receive information via a listserv or state archival association. This statement showed that the participant valued the ability to consult with a colleague.

Overall most of the repositories (37) represented by the study participants had a small FTE (less than 8) and the overall average FTE was relatively small (6). The extent of the range (37.5) illustrated the great disparity between the staffing resources at different repositories.

All of these statistics show that the amount of available staff time and manpower was relatively low for the whole sample population, with most of the repositories (74%) considered small by this study's definition. These statistics gave poignancy to some of the participants' statements, such as when A19 said, "If you can't batch edit or create, people will say there is not enough staff time and will not want to do it."

Under the assumption that most large repositories would have more resources overall than small ones, I had predicted that a greater percentage of large repositories would have implemented PREMIS. However, this turned out to not be true among the participants in this study. While one of the participants who worked for a repository where staff had implemented PREMIS (A5) and the participant who worked for a repository where staff were developing an implementation plan (A29) represented large repositories, PREMIS had not been implemented by staff at most of the large repositories.

Notably, the interviews revealed that the barriers of lack of technical and/or programming knowledge and lack of institutional support were connected at many repositories. Often repositories' staff members had difficulty or were unable to get the technical and programming expertise they needed because the administration lacked support for their goals. The study suggested the internal structure of the repository had an effect on the availability of such expertise. In repositories where the archive's staff was reliant on an IT department that provided service to the whole organization, technical and programming knowledge were more scarce than at repositories where a dedicated IT staff member resided within the archives. Additionally, when individual members of a repository's staff possessed this kind of expertise themselves, the archive's staff was greatly empowered because they were less reliant on the IT staff. This self-reliance increased the staff's ability to complete more digital projects which in turn benefited the repository's collections.

Participants' responses demonstrated that both of these barriers were often causes of the participants' feelings that their repository's metadata needs had not been met. A20

answered that her repository's preservation metadata needs were not being met. She explained by saying she and colleagues experienced a lack of technical and programming support and expertise because their IT staff was consolidated into a department that served the parent organization first and foremost. As a result of this organizational structure, the needs of her repository's digital objects came second.

This study illustrated the current trend within cultural heritage institutions to focus on providing faster access to growing quantities of digital resources. The internet now provides people with mass quantities of information almost instantly, which has caused patrons to expect a similar wealth of instant digitized knowledge from cultural heritage institutions. The surge in available online information and increased user expectations has caused a sense of urgent need to stay relevant among the administrations of many cultural heritage institutions, which has often resulted in a focus on increased output of digital resources.

Overall internal factors affected the repository staff's implementation decisions more often than external factors. Only seven out of the 47 participants (14.89%) who reported PREMIS had not been implemented at their repository identified criticisms of the standard itself as barriers to implementation. All of these participants had fairly detailed knowledge of the standard.

Many participants may not have recognized the issue of PREMIS' complexity as an important barrier because they were focused on their more immediate internal barriers. Many participants were not very familiar with PREMIS, and therefore, would not have recognized the standard's complexity as a barrier to implementation at many repositories until their internal barriers were eliminated. For example, A42 reported that her

repository's staff had implemented PREMIS but had since discontinued using the standard partially because of the problems caused by its complexity. Other participants praised the activities and literature of the PREMIS Working Group and Maintenance Activity. For example, A17 said PREMIS was a "good, robust standard."

Second, all three categories of participants were asked to identify specific types of support not currently in existence that they thought would help the staff at their repository become better able to implement PREMIS. Automation tools were the number one most requested type of support overall, and they were requested by at least one participant from each of the three groups. These findings suggest that the development of PREMIS-specific automation tools and their incorporation into existing software would encourage the use of PREMIS within American archives.

Third, participants who said their repository's staff had implemented PREMIS or developed an implementation plan were asked how well they felt PREMIS had fulfilled their repository's preservation metadata needs. All of the participants who said their repository's staff had not implemented PREMIS were asked if their repository's preservation metadata needs were currently being met. Both of these questions addressed the topic of meeting preservation metadata needs. The first measured PREMIS' real-world ability to meet the preservation metadata needs of repositories. The second shed light on how well staff at various repositories felt they were able to fulfill their own preservation metadata needs, given the standards, tools, and software currently available.

Almost half of all participants, 48%, said their repository's preservation metadata needs were not currently being met. This suggested that more needs to be done within

the field to promote and encourage the adoption of digital preservation policies, such as implementing appropriate metadata standards.

On a positive note, many participants who felt their repository's preservation metadata needs were not being met were also addressing that problem in some significant way, often by dealing with the lack of or constraints of their technological platform. For example, A15 reported that her repository's staff had hired a consultant to help them determine how to better meet these needs while using the current system.

Overall, the interviews demonstrated that PREMIS was on the minds of staff at many repositories, but the decision to implement was either being rejected or postponed by most repositories because of the identified barriers. The extremely low percentage of repositories that had implemented PREMIS suggests that the PREMIS adoption rate is likely to be similarly low for the entire population of American archives.

The findings suggested that PREMIS has gained some traction since most of the participants were aware of PREMIS and many had discussed implementing it. 57.44% of the participants who reported the standard had not been implemented at their repository said they thought it was likely or very likely their repository's staff would consider or reconsider implementing PREMIS in the future. Many repositories reported seeing benefits to implementing PREMIS but were slow to implement because of the barriers discussed previously. Some had notable confusion and anxiety about the actual implementation process, and therefore wanted more guidance on "practical" implementation under real life constraints.

Opportunities for Further Research

Some of the findings in this study present opportunities for further research. First, participants revealed that lack of staff not only made it harder to get the work done, but it also increased the difficulty of assessing the work that needed to be done. The later has been little discussed in the field. Perhaps further research could lead to recommendations on how to overcome this obstacle.

Second, more research is needed to investigate the barriers staff at all cultural heritage institutions face when trying to develop a plan for metadata creation for digital objects. It seems likely that many of the barriers may be the same as those revealed in this study.

Additionally, the PREMIS Maintenance Activity announced via their website on May 16, 2012 that Version 2.2 of the PDD is now available. After some time has passed, a study investigating whether or not the changes made in the latest version have impacted the adoption rate at American archives could be useful.

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Appendix A: The Interview Questions

Interview questions: The Current Status of PREMIS (PREservation metadata:

implementation strategies) Implementation in American Archives and Historical

Societies and Influencing Factors

1. Does your repository's staff apply the PREMIS standard for preservation metadata to

   your digital objects in any way?

If Yes to 1:

2A. Which entities do you use the most?

3A. Are there any elements you always use?

4A. Are there any elements you never use?

5A. Are there any internal policies about how to apply PREMIS at your repository? If so,

what are they? Are they documented?

6A. May I have a sample digital object and correlating PREMIS record?

7A. Are there any other systems used by your repository's staff that interact either very

well or very badly with your PREMIS metadata?

8A. How long has PREMIS been implementing at your repository?

9A. How well do you feel that PREMIS has fulfilled your preservation metadata needs?

10A. Are there issues with PREMIS currently that you feel its creators need to address?

11A. When deciding whether or not to implement PREMIS at your repository, what potential barriers to implementation did you discuss?

12A. What resources (training, literature, membership on listserv) did your repository's staff use in preparing for your PREMIS implementation?

13A. Is there any specific type of support not currently in existence that you think would help you become better able to implement PREMIS?

14A. Does your repository's staff use another metadata standard to record preservation metadata in addition to PREMIS, such as METS or DublinCore?

15A. What did your repository do with regards to preservation metadata before it started using PREMIS?

If NO to 1:

2A. Did your repository's staff ever discuss implementing PREMIS?

3A. If yes, when deciding whether or not to implement PREMIS at your repository, what potential barriers to implementation did you discuss?

4. If yes, ultimately, what was the biggest reason your repository's staff chose not to implement PREMIS?

5A. Does your repository's staff assign preservation metadata to its digital objects in any way?

6A. Is there any specific type of support not currently in existence that you think would help you become better able to implement PREMIS?

7A. Are your repository's preservation metadata needs currently being met?

8A. How likely is it that your repository's staff might consider or reconsider implementing PREMIS in the future?

Answer choices: Very likely, Likely, Somewhat likely, Not likely

Appendix B: First Invitation to Participate

Hello,

My name is Alston Brake, and I am a Masters student at the School of Information and Library Science at UNC-Chapel Hill. As part of my Masters paper, I am conducting a research study about the factors affecting PREMIS adoption in American archives. Based on your employing institution's website, I believe your position has responsibilities for managing digital content. Therefore, I would like to conduct a telephone interview with you regarding your archive's implementation of PREMIS to your digital content or lack thereof. The interview should last approximately 15-30 minutes. I have attached the adult consent form, which will provide you with all the details about the study. If you are willing to take part in this study please reply to this message, indicating your consent to participate and provide me with the phone number I should call to set up a time for the interview. Thank you very much for considering this request of your valuable time.

Sincerely,

Alston Brake
alston.brake@gmail.com
919-889-2221

Appendix C: Second Invitation to Participate

Hello,

My name is Alston Brake, and I am a Masters student at the School of Information and Library Science at UNC-Chapel Hill. As part of my Masters paper, I am conducting a research study about the factors affecting PREMIS adoption in American archives. Based on your employing institution's website, I believe your position has responsibilities for managing digital content. Therefore, I would like to conduct a telephone interview with you regarding PREMIS and to discuss if your archives has implemented it and why or why not. The interview should last approximately 10-30 minutes. I have attached the adult consent form, which will provide you with all the details about the study. If you do not wish to participate, please respond to this message by 4/5/12. If I don't hear from you, I will call your office and see if we can arrange a time for an interview. Your agreement to an interview will be your consent to participate in the study. Thank you very much for considering this request of your valuable time.

Sincerely,

Ms. Alston Brake
alston.brake@gmail.com
919-889-2221