State of North Dakota
DIGITAL ARCHIVES STUDY REPORT

Current State Assessment

This document provides an analysis by Tournesol Consulting of current resources and volumes, recordkeeping practices, technology infrastructure, and financial resources related to management of North Dakota government records and digital repositories. The purpose of this current state assessment is to establish a baseline to inform the development of recommendations and strategies to address digital preservation of archival State and local government records.

The second part of the Digital Archives Study Report will offer recommendations for the authorities, technology infrastructure, strategy, policy framework, and funding options to establish and sustain a digital preservation repository that will preserve and provide access to electronic government records of permanent historical value.

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Records Management for a Changing Environment

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Introduction

This report provides the Tournesol Consulting team's preliminary analysis of the recordkeeping environment in North Dakota state government including current SHS and ITD resources, volumes and trends in the use and storage of electronic records and data, existing and evolving technology infrastructure, and funding framework. The objective of the analysis is to baseline current capabilities and to identify opportunities and constraints that may impact the practicality of any proposed solutions for the establishment and sustainability of digital preservation repositories that are sufficient to meet the State's obligations. It also establishes the conceptual framework for the recommendations related to technology infrastructure, policies and strategies which will form the second part of this Digital Archives Study report.

This report contains an analysis of the State Archives' most recent Digital Preservation Capability self-assessment results. A description of the 15 components of the Digital Preservation Capability Maturity Model© (DPCMM) and the current capability "score" is provided along with observations gleaned from the interviews with state agency representations. It is our intention that this analysis helps to facilitate dialogue among project stakeholders on applicable standards[1] and benchmarks for the Digital Archives[2] framework.

This report includes a gap analysis of several repositories that house state government records against accepted records management and digital preservation standards. Two successful collaborative initiatives are discussed to baseline the potential for centralized repository management and strategies to address economies of scale. One cloud-based system under development is discussed to represent an outsourced records management approach.

Digital Archives Study Objectives

Despite the fact that all levels and branches of government are using digital information technologies to conduct the people's business, the State of North Dakota does not yet have a unified plan or the requisite technology infrastructure to manage electronic records in accordance with existing retention schedules and statutory obligations. This includes the accession by the State Archives of permanent records of historical value that are born digital or converted to digital format by agencies in the normal course of business.

The Digital Archives Study project is intended to define the capabilities and strategies that the Information Technology Department (ITD), the State Historical Society, and State Records Management need to develop to manage and preserve permanent digital assets as an integral and crucial component of responsible enterprise information governance. We also hope to offer a blueprint for proactive

[1] The Digital Preservation Capability Maturity Model is based on the Open Archival Information System (OAIS) Reference Model (ISO 14721:2012) which identifies high level services and requirements that a digital preservation repository should provide to support long-term access, and ISO 16363:2012 which specifies auditing criteria for the certification of trustworthy repositories.

[2] For the remainder of this report the terms "digital preservation repository" or "digital archival repository" are used to refer to the State Archives' repository that will manage electronic state and local government records of permanent historical value.

engagement, planning and coordination with state agencies that are transitioning to reliance on digital information assets and records and must also find cost effective ways to integrate digital preservation capabilities into existing programs, responsibilities and mandates.

Project Methodology

As part of the project planning exercise, the State of North Dakota project team and Tournesol consultants identified sources of information to inform an understanding of the current environment and future preservation needs.[3] Working from a list of permanent government records and agencies using FIleNet, a cross-section of Executive Branch agencies was identified to participate in interviews. To ensure adequate representation by all three branches of government, meetings were arranged with individuals familiar with the recordkeeping practices and information management environments of the Supreme Court, District Courts, and the Legislative Council.

Agency Records Coordinators and technical leads were invited to participate and a set of interview objectives sent out in advance to frame the discussion. Since the project kicked off in mid-February, 34 in-person and phone interviews with state government employees have been completed.[4] The team also contacted vendors to supplement interview notes with specific details of state applications and technical initiatives.

Since the interviews were completed the Tournesol Consulting team has pored over dozens of reports, plans, policies, procedures, standards, position descriptions and statistics to gain an understanding of the North Dakota state government environment and operations. We have synthesized our observations and findings into this draft current state assessment report and invite review and commentary by the State of North Dakota project team and other stakeholders.

After submission of the draft current state report the Tournesol Consulting team turned its attention to defining the information technology strategy, preservation policy framework and sustainable funding model to support the establishment and on-going operation of a standards-based trusted digital preservation repository to protect and ensure access to authentic permanent historical electronic records. We will apply our knowledge and experience in records management, archives, information technology implementation strategies, and experience on similar government projects to develop recommendations tailored for the State of North Dakota that can be shared with the legislative assembly appropriations committee this summer.

[3] A list of resources reviewed by the Tournesol Consulting team is provided as Appendix A.
[4] A list of the individuals who participated in interviews for the Digital Archives Study is provided as Appendix B.

Terminology Bridge

Conversations among and between business users, archivists, records managers, and information technology specialists sometimes get off track because the participants are not "on the same page" due to differences in their understanding and use of key terms. We believe it is critical that the consultants and stakeholders engaged in the Digital Archives Study share a common vocabulary so this section discusses five terms used in this current state assessment and which will be applied in our recommendations. Readers of this draft current state assessment as well as the subsequent findings and recommendations should reference these definitions and thereby help ensure that the consultants, the project management team, and stakeholders in this initiative are in synch.[5]

Archive

Historically, the term Archive has referenced a media independent repository operating under the authority of an organization or group (e.g., a business, state, or academic institution among others) that has the mission for as far into the future as required to:

- Assume legal and physical custody of non-operational records that document rights and privileges, policies, procedures, and actions of an organization or individual
- Protect the records from loss, corruption, and tampering
- Make the records available to any individual or organization for research purposes in accordance with access restrictions

Paralleling the invention of computers and evolution of the industry was the development of jargon that defined archive in several closely related ways:

- A place to store computer records that are no longer required for operational activities
- A place to store computer records (typically tapes) for backup and disaster recovery purposes
- A low cost storage environment where infrequently accessed computer records can be transferred from high speed storage devices
- In recent years the use of "archive" has been extended to domains such as email, web sites, health records, and scientific records, among many others
- Many software companies support tools to "archive" inactive history from a database that must be retained for several years because of regulatory and/or business purposes. The history tables are physically segregated from operational tables.

Digital archiving and digital archive also emerged as terms used in the computer industry to describe the processes and actions involved in capturing and transferring digital content to low cost storage, backup and disaster computer tapes, and hierarchical storage depending upon the frequency of access.

[5] Additional terms and definitions can be found in Appendix C.

Digital Repository

A digital repository is a computer system used for the storage and distribution of electronic content under varying circumstances and time periods. In general there are four (4) levels of digital repositories that are likely to be encountered in a highly diverse computing environment such as in a state government enterprise. The State of North Dakota repositories described in this current state assessment have been categorized using these levels for illustrative purposes.

Level 1: A Level 1 digital repository typically is a shared file server that supports one or more business units but has limited management functionally because anyone with access rights can create, revise, and delete electronic content.

Level 2: A Level 2 digital repository supports a large number of users, some of whom are distributed across multiple departments. The digital content is probably stored in a relational database system. Most level 2 digital repositories support robust access controls, transaction logs, referential integrity, version control, check out functionality, metadata (e.g., file name, author, date created, etc.), and table "pruning" and "purging" functionalities. A Level 2 digital repository is likely to contain electronic records of both temporary and long-term value.

Level 3: A Level 3 digital repository has a custodial mandate to preserve and make available special electronic records of long term (75 years or longer) value which could be vital records, human resources, environmental management, maps, scientific and technical data, among others. Because of the projected long term retention period Level 3 digital repositories are likely to have an informal protocol to migrate all electronic records to new technology platforms as required to support present and future access.

Level 4: A Level 4 digital repository is designed to manage permanent digital objects and conforms to the specifications of two international standards – ISO 14721:2012, Open archival information system (OAIS), and ISO 16363:2012, Audit and certification of trustworthy digital repositories. Among the key features of a "trustworthy digital repository" are infrastructure components and services that include integrity validation (hash digests, digital signatures, and time and date stamps), device/medial renewal, storage, migration, format transformations, and preservation metadata.

Based on the Statement of Work for the Digital Archives Study project and the interviews conducted with State of North Dakota stakeholders, the Tournesol Consulting team has concluded that the "Digital Archives" required by the State Historical Society to preserve and protect state and local government records of enduring value must meet the standards for a Level 4 repository. The terms "digital preservation repository" and "digital archival repository" are used interchangeably in this report to refer to that Level 4 repository.

Authenticity

Authenticity means that an electronic record is what it purports to be, that its structure, content, and context have not been tampered with or corrupted. ISO 14721:2012 describes this as documented "fixity." Moving electronic content into a digital repository or transferring it from old storage devices or media to new storage devices or media creates the risk of a loss of bits that compromise authenticity. In addition, electronic content can be deliberately tampered with without leaving any visible evidence of compromised integrity.

A Level 4 digital repository mitigates this risk exposure by generating hash digests, a digital fingerprint of the content before and after device/media renewal and internal system transfers and comparing the two hash digests. If the two hash digests are identical then no loss or change has occurred. A change or loss in only one bit will result in a post hash digest that is different than the pre-hash digest. The National Institute of Standards and Technology (NIST) recommends use of Standard Hash Algorithm 1 (SHA-1) to generate hash digests that are highly reliable.

Hash digests of digital content after file format transformation always will be different from the pre-file format transformation because a change has occurred in the bit stream underlying the digital content. One recommended way to offset this is to combine the two hash digests into a super hash and then digitally sign and date and time stamp the super hash. The digital signed super hash with a time and date stamp should be treated as preservation metadata that is tightly associated with the digital content. Preservation of the hash digests and super hash digests that are digitally signed and time and date stamped after preservation actions constitutes a strong chain of custody that supports the authenticity of electronic records.

Authoritative Copy

In today's increasingly digital world it is likely that many organizations will retain multiple instances of the same record. In the domain of Archival Science the originator of content is considered the "Office of Primary Responsibility" and it is this entity that is governed by the Records Retention Schedule. Duplicate records that serve as reference/convenience copies should be discarded when no longer needed to support business operations. As a general rule the properties of authoritative electronic records are automatically captured in document attributes and system metadata. These properties may include record producing unit, originator, author, date created, version number, control number (series number), recipients, and subject line.

A more challenging issue occurs where multiple instances of the same record exist as born digital, digitally scanned, paper, and microfilm records. There are numerous cases where an official record, say agency director's correspondence, is created using a desktop application and then printed and signed with a "wet signature." The signed hard copy record is then scanned and retained as a PDF image. The

PDF image may get attached to a transmittal email. The email transmittal is printed to paper and stored with the hard copy signed letter. The PDF image and email may also be retained on the Exchange server. A microfilm copy also may be produced. In such a case, which is the authoritative copy? According to Archival Science it is the PDF image because it achieves its designated purpose, that is, it has been transmitted. There is no inherent difference in the content, structure, and context between wet signature paper documents and their PDF image counterparts. Digital images of paper records have the same legal standing as paper records.

There is ample evidence that North Dakota state agencies and local government units convert hard copy to digital images and maintain both as authoritative records, sometimes with paper records considered "backups" that can be transferred to a low-cost storage facility. In at least a few instances it was learned that agencies have converted hard copy permanent records to digital images which are retained on operational servers and transferred the paper source materials to the North Dakota State Archives.

Duplication can create an unnecessary cost burden that can be minimized by treating paper records that have been digitally scanned as "convenience copies" that can be destroyed after a relatively short period. It behooves any organization with parallel streams of scanned images and paper records to dramatically reduce the volume of convenience copies of paper records after ensuring that the scanned images serving as the authoritative record copy are managed under adequate records lifecycle controls.

Digital Preservation

Digital preservation is the active management of electronic content over time to ensure the readability, usability, integrity, and accessibility of electronic records across technology generations. A key service is physical and logical mitigation of technology obsolescence.

Physical mitigation encompasses periodic renewal of storage devices and media while logical mitigation references transformation (sometimes referred to as migration) of old file formats to contemporary ones. Logical mitigation presumes there is "a window of opportunity" in which backward compatibility in file format standards across several generations of technology exists. The failure to utilize this "window" locks electronic content in legacy file formats that are likely to require special written computer code to effect this transformation.

Level 1 -3 digital repositories do not conform to the specifications of ISO 14721:2012, Open archival information system (OAIS), and ISO 16363:2012, Audit and certification of trustworthy digital repositories so an organization that aspires to a Level 4 digital repository must make the necessary investments and operational commitments to advance to that level.

State of North Dakota Current Environment

This section of the report is intended to demonstrate the Tournesol Consulting team's understanding of the current environment in North Dakota state government operations. In accordance with the Digital Archives Study project scope of work, the review includes insights gained through: collaboration with the North Dakota project team; interviews with a cross section of agencies in the executive, legislative, and judicial branches of government; analysis of current staffing and funding resources; review of the ITD billing structure and practices; an assessment of records scheduling and transfer protocols, and storage volumes and trends.

State Government Funding Framework

The State Government of North Dakota operates on a biennial budget with state agency budget planning occurring in even numbered years and appropriations occurring in odd numbered years. The State Legislature appropriates funds in three broad categories: General Funds, One Time Expenditures, and Special Funds such as funding from federal agencies and donations.

General Funds are line item budget entries such as costs for personnel, supplies, building maintenance, and the like. One Time typically involve procurement of capital assets or special initiatives that may stretch over two or more biennial budgets. So far as Special Funding is concerned the Legislature authorizes "not-to-exceed" expenditures but in actual practice the amount spent may be less because the amount of the funding was less than projected.

The Information Technology Department has a special funding mechanism for providing services, including procurement of computer systems, to state agencies. Agency budgets include funding requests for these services. If the funds are approved they are treated as line item budgets ITD can "charge back" to the agency at the cost of the service. The amount of the "charge back" varies, depending upon the service level agreement. In certain instances, such as the North Dakota GIS Hub which is comprised of geospatial data storage, data services, and applications operated by ITD and the GIS Technical Committee, the Legislature appropriated funds to provide funding for services common to participants.

The State Archives budget for the current biennium was $111,000. The current funding is inadequate to meet the modest trickle of permanent, historical records coming into the State Archives today (17 series from the Department of Transportation in February 2014 alone) much less the permanent state and local government records of archival value that have already been converted to digital format. The budget shortfall affects both staffing and ITD resource availability. Furthermore, other staff are experiencing resource shortages affecting their long-term management of information assets (e.g., the GIS Hub team).

Tournesol believes that the nature of electronic records is such that the establishment, implementation, and on-going maintenance of digital preservation repositories (including the State Archives) that are capable of ensuring the continuity of electronic government records far into the future cannot be a one-time capital expenditure. Official repositories of state and local government records of enduring value which document and protect the legal and financial rights and the cultural memory of North Dakota and

its citizens will require substantial funding on a continuing basis. The second part of the study report will provide recommendations for sustainable funding of the State Historical Society of North Dakota's digital preservation repository.

Information and Records Management Governance

These existing statutes, guidelines, policies, and practices govern the activities of the State Archives and the Information Technology Department. While the statutory mandates provide sufficient grounds to manage state government records regardless of retention, format or storage location, establishing and sustaining enterprise-level digital preservation capabilities and sufficient resources to protect permanent electronic records is likely to require new and explicit authorities and guidance. In the second half of this report to be delivered in April, Tournesol will provide recommendations for a policy framework and strategy that includes proposed changes to existing statutes sufficient to empower the digital preservation repository.

Current Statutes

State Archives - Century Code 55-02.1 Archival Resources and State Archivist

The statutory authority for the North Dakota State Archives is ND Century Code 55-02.1-08. It identifies the duties of the state archivist that include:

- Maintain a program for the appraisal, selection and preservation of state and local government records
- Serve as the custodian of the archival resources of the state
- Receive records transferred to the archives for retention
- Arrange and describe records transferred to the state archives
- Manage the state historical society's depository for archival resources
- Enable the availability of archival resources to the public

Information Technology Department - Century Code 54-59 Information Technology Department

The statutory authority of the North Dakota Information Technology Department is ND Century Code 54-59. It specifies the powers and authorities of the Department that include:

- Establishment of the Chief information Officer of the State
- Review and approval of the purchase or lease of information technology hardware, software, and service
- Establishment of a State information technology advisory committee with the mandate to advise the department regarding statewide information technology planning and budgeting, services of ITD, information technology initiatives and policies, and review reports on major information technology initiatives
- Develop statewide information technology policies, standards, and guidelines
- Provide guidance and facilitate collaboration where appropriate to health councils and councils dealing with educational technology and criminal justice

Current SHS and ITD Policies, Guidelines and Standards

The current procedures of the State Archives address traditional activities that include appraisal, acquisition, transfer, accession, preservation, and access. Electronic records are not mentioned anywhere in the documentation. Two tasks are significantly impacted by the activities and practices of ITD's Records Management unit including:

> **Appraisal** - Appraisal policy focuses exclusively on paper records and is largely driven by Records Management and the Retention Schedule and Records Inventory processes. Appraisal can take place at the collection, creator, series or item level but most commonly is done through the State Archivist's review of proposed records series for agency records. The State Archivist checks a box on the Records Series Description form if the records series is of permanent historical value. In general the State Archivist reaffirms this preliminary assessment only when the records are transferred to the State Archives, which may be many years or decades later.
>
> **Transfer** –State and local government transfers to the State Archives are governed by the transfer and packing procedures issued by the SHS. The Records Disposal Report issued on an annual basis by ITD's Records Management section starts the wheels in motion and in most cases, agency or local government staff will pack boxes and transfer the records to the State Archives. Formal transfer of custody of records to the State Historical Society, record series descriptions, packaging (acid free boxes) and labeling instructions for boxes, and inventory of boxes are facilitated by SHS. The Archives staff may also identify and transfer archival resources from an agency or local government unit. The current record transfer protocol along with a section on media acquisition focuses exclusively on physical paper records and is unworkable for the transfer of electronic records. By default the State Archives does not have a transfer protocol for electronic records although it has been accepting CDs and DVD-Rs submitted by some agencies. Of course, CDs and DVDs are acceptable for transfer purposes but not for archival storage.[6]

The Information Technology Department has a significant number of standards and guidelines available on its website. The materials reviewed by the Tournesol Consulting team for this assessment included:

> **Document Management (DMT003-06.1)** - The stated purpose of this one page document is to promote the sharing of information, purchase of development tools/languages, coordinate training, and reduce costs of training. It specifies that all new document management initiatives must use an Enterprise Repository and presents key definitions, including "record." This brief policy document was issued in 2006 and therefore it is out of date. It does not recognize that a Document Management System may contain records of permanent value that must be treated differently than records of temporary operational value.
>
> **Databases (DIT001-04.1) -** This policy was issued in 2004 and has not been revised. It requires use of Approved Databases. It specifies that databases will be consistent across the enterprise and that "the quality, reliability and integrity of the data must be maintained." This policy

[6] Digital preservation community practices recommend against the archival storage of electronic records of historical value on CDs and DVDs. However, there is no inherent reason why they cannot be used for transfer purposes when this may be the only practical way of transferring records, especially when the volume of records is relatively small.

document does not address electronic records management issues such as mapping relational database tables to records series and their associated retention period or ensuring access to records in tables that may be required for operational purposes for decades as database technologies change. Nor does it provide guidance on how "pruning" tools may be used to delete digital information and objects in database tables that are eligible for destruction.

Digital Imaging (DMT001-04.1) - This policy, which was issued in 2004, identifies seven imaging standard formats and specifies that if a record has a permanent retention the minimum scanning resolution is 300 dpi. Otherwise, the minimum accepted scanning resolution is 150 dpi. This policy document is out of date with regard to standard image formats, the recommended scanning resolution, and quality control procedures. The latter is important for meeting federal and state rules of evidence. Its stated purpose is inconsistent with the current rationale for digital scanning projects and programs that were identified during agency interviews.

Electronic Records Management Guideline - This is a comprehensive document that provides guidance on such topics as what Electronic Records Management is, using electronic information systems, maintenance of electronic records, disposition of electronic records, establishing an electronic records management program, the security of electronic records, and the transfer of historical electronic records to the State Archives. Overall, this is a useful document but some of the definitions used are inconsistent with current digital preservation good practice. In addition, the electronic records transfer section stipulates that agencies should follow the transfer protocols of the State Archives.

Enterprise Architecture (EA) Standards and Guidelines – The EA domains and standards support the work of the Information Technology Department to promote collaboration between and among state agencies. Standards in several domains including Security, Communications, Application Software, and Servers and Storage have been recently reviewed. The Document Management standards are significantly outdated.

Geographic Information Systems Standards and Guidelines (available on the GIS Hub site) **-** This rich collection of resources promote collaboration and mechanisms for sharing of data and information between and among GIS stakeholders for as far into the future as may be required. This collaborative initiative in concert with Enterprise Architecture may provide models for an enterprise digital preservation program that has the strongest and highest support of state government leadership.

Records Migration (DMT004-04.1) - This standard was issued in 2004 and its policy at the time was to ensure "Records will be provided to ensure business continuity and to meet business and regulatory requirements" and that record owners must be able to "provide a proven way to migrate records to a format that can be accessed with available technology." This policy is couched in such general terms that it is doubtful it can inform agencies why record migration is a key element in a digital preservation program or what specific actions that must be taken to ensure that accessible, usable, understandable, and trustworthy records despite the changes in technology platforms over time.

As noted previously, Tournesol believes that the North Dakota Century Code 55-02.1, Archival Resources and State Archivist, and Century Code 54-59, Information Technology Department, can be enhanced to address the requirements of an enterprise digital preservation program that is sufficiently robust to meet the evolving needs of state and local governments. The appraisal and transfer protocols for records require a major update suggesting tighter coordination between the Records Management analysts, supervisor and Archives staff. The ITD policy documents for databases, digital imaging, databases, and records migration are outdated and will require a major rewrite. The Electronic Records Management Guideline provides a great deal of useful information however there are instances of incorrect terminology that must be corrected. Processes and documentation for retention scheduling and archival appraisal should be modernized to take into account the operational environments used by state and local government units and the role of third parties in the management of state government records. Greater collaboration and coordinated requirements analysis is needed by the task force that approves retention schedules or the electronic records created, managed and relied upon by all three branches of North Dakota State government will continue to be at significant risk.

Agency Engagement

Electronic records management and digital preservation can be considered as subsets of the broader function of data governance. Both ITD and the State Historical Society will have to find new ways to engage agency personnel in identifying requirements for permanent operational and historical records that can better inform architecture, system planning and configuration, standards, interoperability requirements, as well as hosting and storage services.

Collaboration and continuity planning are impeded when there is no enterprise view of data governance that takes into consideration the value of information in the short term and from a historical perspective. For example, the Longitudinal Data Systems Strategic Roadmap in 2008 observed the following:

> "Agencies have a well-established history of gathering and reporting data. Some agencies have nearly 20 years of historical program data. Each agency has a regular schedule for data collection and reporting generally based on state and federal reporting requirements. That said, data collection is not as streamlined as it could be. The absence of data governance councils at the state and agency levels creates a data system void of the data definitions, rules, and processes needed to ensure data consistency, quality and reliability. Data is collected via paper, electronic files and face to face interviews, yet agencies are not collecting all the data they believe are needed to inform and improve program operations."[7]

The North Dakota GIS Program Report (July 1, 2012 – June 30, 2013) introduced the important concept of "data stewardship." However, that same document articulated the challenge of coordination resulting in "duplicated efforts and expenses and missed opportunities." Duplicated efforts, redundancy and missed opportunities are all data governance issues related to records management and digital preservation activities.

[7] State of North Dakota Longitudinal Data System Strategic Roadmap; Prepared by Claraview; Page 4; June 12, 2008.

Current Level of Skills and Expertise in Digital Preservation

The interview sessions held with Records Coordinators, IT Coordinators, and other staff members representing state agencies exposed serious gaps and risks with regard to training and staffing for long-term digital preservation. In many agencies the Records Coordinators are administrative assistants with limited records management training or time for proactive engagement in records planning. Since there isn't a centralized State Records Center, these individuals were frequently the guardians of the paper file storage in agency vaults, Capitol Building basement vaults, or that are housed with third party vendors. In some of the larger agencies Records Coordinators were dedicated records management resources however they did not appear to have any exposure to digital preservation issues or good operational practices. File plans were present throughout the agencies interviewed, but they were often managed on a division by division basis with limited exposure between units. Agency IT personnel are focused on day-to-day operational capabilities and have little awareness of preservation activities other than data protection.

The ITD personnel interviewed for the Digital Archives Study have a more mature view of digital continuity however the prevailing attitude of many was that preservation was an end-product and not a process that permeates the design, implementation, management and decommissioning of applications. The concept of preservation information as an asset to be protected, managed, conserved, and made available for re-purposing was understood and embraced by a minority that included the GIS Manager and Business Intelligence.

The State Historical Society has tried unsuccessfully to secure funding to hire a digital archivist. No one on the current staff has experience or training in digital preservation. The State Archivist has yet to be integrated into planning and implementation for systems that create and manage records of permanent historical value. The State Records Management Administrator had a chance to participate in some PeopleSoft planning meetings but is not routinely included in systems planning activities. The expertise of one or more specialized analysts could be used to ensure that digital preservation planning is "baked into" state-sponsored IT activities by participating in enterprise architecture reviews, application development and maintenance reviews, disaster recovery, and other activities where data governance is a factor.

State Archives Digital Preservation Capability Assessment

This section provides a high level analysis of the current digital preservation capability of the North Dakota State Archives based on the self-assessment statements selected on March 7, 2014 by Ann Jenks and Becky Lingle in collaboration with Tournesol Consultants Lori Ashley and Charles Dollar. The self-assessment was completed using the Digital Preservation Capability self-assessment tool provided by the Council of State Archivists (CoSA). The State Archives scored 11 out of 60 points indicating that current digital preservation capabilities are rudimentary and that most electronic records that merit archival preservation are at risk. A copy of the self-assessment output is provided as Appendix E.

In this section of the report, the 15 components of the Digital Preservation Capability Maturity Model© *(see Figure 1 below*) are described using text from the self-assessment survey followed by the North Dakota State Archives score and the rationale. A brief commentary about the significance of these results is provided. For the Digital Preservation Infrastructure components notes from the interviews with state agencies representatives conducted by Lori Ashley, Bob Rogers, and Charles Dollar during the week of February 24, 2014, are also offered.

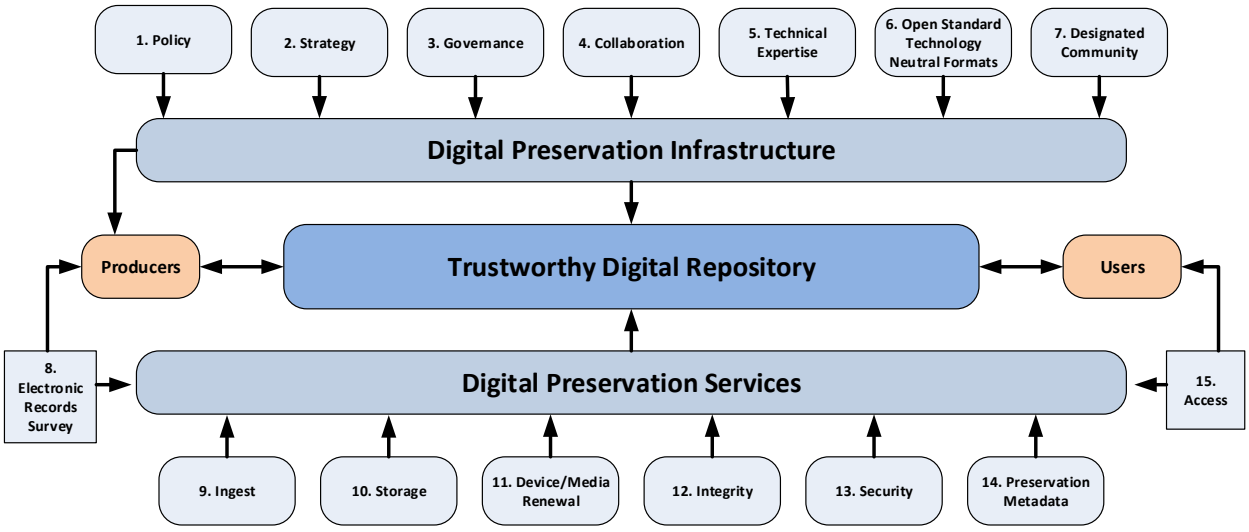


Figure 1. Digital Preservation Capability Maturity Model© (DPCMM)

Digital Preservation Infrastructure

There are seven (7) infrastructure components that are essential to ensure a sustained organizational commitment, including adequate technical and preservation expertise and resources, to the long-term preservation of electronic records:

- Digital Preservation Policy
- Digital Preservation Strategy
- Governance
- Collaboration
- Technical Expertise
- Open Standard Technology Neutral ("OS/TN") Formats
- Designated Community

Digital Preservation Policy

The government unit charged with ensuring preservation and access to permanent legal, fiscal, operation, and historical records should issue its digital preservation policy in writing including the purpose, scope, accountability, and approach to the operational management and sustainability of trustworthy digital repositories.

North Dakota State Archives Score: Nominal (0)

Performance Metric: The Archives does not have a written digital preservation policy.

Rationale: The North Dakota State Archives does not yet have a written digital preservation policy. The State Archivist reported that a number of agencies have made formal requests for the Archives to accept electronic records. In February 2014 the Archives accepted 17 records series sent by the Department of Transportation on DVD-Rs and CDs.

Interview Observations: ITD and SHS leadership recognize that resources and investments are needed to support effective and efficient management of archival State and local government records. Some of the agencies interviewed have adopted ad hoc "best practices" for managing hard copy records converted to digital images with long-term retention requirements. Neither ITD nor the State Archives are currently providing guidance to agencies with regard to digital preservation practices or standards.

Digital Preservation Strategy

The organization charged with the preservation of permanent electronic government records must proactively address the risks associated with technology obsolescence including plans to periodic renewal of storage devices, storage media, and adoption of preferred preservation file formats.

North Dakota State Archives Score: Nominal (0)

Performance Metric: The Archives does not have a plan to address technology obsolescence.

Rationale: The State Archives does not currently have a digital preservation strategy.

Interview Observations: The agencies interviewed and all three branches of North Dakota State government recognize the need to plan for and secure funding to address technology changes. Agencies using the State's FileNet document repository follow ITD recommended practice to use interoperable file formats for the storage of digital image copies, however there is very little evidence of any plans for long-term continuity. Several agencies that have long-term operational records requirements and do not use ITD services also convert records to non-proprietary formats. Some agencies assume that all content that is published to their websites will remain available and viable indefinitely.

Governance

Digital preservation governance means there is a formal decision-making framework that assigns accountability and authority for the preservation of electronic records with permanent historical, fiscal, operational or legal value, and an explicit approach for how to meet stakeholder needs. Governance is exercised in conjunction with information management and technology functions and with other custodians and digital preservation stakeholders such as records producing units and records consumers that enables compliance with applicable laws, regulations, record retention schedules, and disposition authorities.

North Dakota State Archives Score: Nominal (0)

Performance Metric: The State does not specifically address digital preservation requirements in the scope of current information technology or records management governance activities.

Rationale: The State Archivist has limited opportunities to 'tag' records of archival value for transfer to the State Archives. It typically occurs during the review of the Record Series Description form prepared by ITD Records Management by selecting "Yes" in the Historical Value tick box at the bottom of the form. There is currently no visibility into where or how the records are being created or managed in the operational environment, and the State Archivist does not have 'a seat at the table' in any digital information systems planning, configuration or implementation meetings. Records Management was involved during the PeopleSoft implementation planning but that participation does not appear to have resulted in the integration of any recordkeeping requirements into that system's operations.

Interview Observations: There is a plan to update Records Management system/processes, but implementation has already been delayed several times. If/when it moves forward it offers some hope that both Records Management and the State Archivist will be better positioned to gather vital information about how and where government records are being created and managed. ITD (Records Management as well as other domains) should take the opportunity to institute system-level appraisal and scheduling since series-level retention scheduling has proven to be an inadequate approach for electronic records and digital information systems.

Collaborative Engagement

Digital preservation is a shared responsibility so the organization that has a mandate to preserve electronic government records in accordance with accepted digital preservation standards and best practices is well served by maintaining and promoting collaboration among its internal and external stakeholders. Interdependencies between and among the operations of records producing units of government, legal and statutory requirements, information technology policies and governance, and historical accountability should be systematically addressed.

North Dakota State Archives Score: Minimal (1)

Performance Metric: The Archives is working to establish a framework for collaborative engagement on digital preservation issues in the state.

Rationale: Funding for the Digital Archives Study demonstrates that the State Historical Society and ITD leadership recognize that action is needed to engage resource allocators and records producer in advancing the State's digital continuity capabilities.

Interview Observations: Several units, most notably the Supreme Court, the Legislative Council, the Water Commission, and Oil & Gas are advancing their digital information management capabilities without explicit leadership from ITD and SHS. While some of the agencies interviewed were sympathetic to the State Archives' need to establish a digital preservation repository, most were primarily concerned with meeting their own operational needs. A few agencies were comfortable giving the Archives paper records because they had already converted the materials to digital image format and tended to view the paper records as backups of the electronic records.

Technical Expertise

Expertise and on-going training is required to support the infrastructure and key processes of an ISO 14721 conforming repository, deploy digital preservation solutions, and ensure lifecycle management processes and controls over electronic records. This requisite technical expertise may exist within the Archives/RM unit, be provided by a centralized Information Technology and Management function or service bureau, or by external service providers and should include an in-depth understanding of critical digital preservation actions and their associated recommended practices. Because digital preservation begins near or at the time of records creation and/or capture, this requirement for technical expertise applies for Records Producers and for Records Custodians.

North Dakota State Archives Score: Intermediate (2)

Performance Metric: The Archives has operational access to technical expertise that supports project-based digital preservation initiatives and to technical expertise that supports DoD 5015.2 compliant electronic records management software.

Rationale: The State Historical Society recently added a technical resource who is participating on the Digital Archives Study team and coming up to speed on the agency's information management practices and needs. He is not, however, a digital preservation expert. SHS requested funding for a new position of Digital Preservation Archivist but the Legislature did not approve it for the Biennial Budget 2013–2015. There is a dedicated ITD resource and an Enterprise Architecture team for the

State's Document Management system (FileNet) but the records management functionality of that system is not currently implemented.

Interview Observations: None of the Records Coordinators or IT staff from the agencies that participated in the interviews have had training in digital preservation principles or techniques. While numerous ITD staff expressed strong interest in the Digital Archives Study findings and recommendations, it was evident that long-term digital continuity and preservation techniques and strategies are not currently a high priority for ITD.

Open Standard Technology Neutral File Formats

A fundamental requisite for a sustainable digital preservation program that ensures long-term access to usable and understandable electronic records is mitigation of obsolescence of file formats. Open standard technology neutral ("OS/TN") file formats are developed in an open, public setting, issued by a certified standards organization, and have few or no technology dependencies. Over time new digital preservation tools and solutions will emerge that will require new OS/TN file formats. OS/TN formats are backwardly compatible so they can support interoperability across technology platforms over extended periods of time.

North Dakota State Archives Score: Intermediate (2)

Performance Metric: The Archives uses Open Standard Technology Neutral file formats for its audio, video, and digital photograph collections.

Rationale: Technology neutral open standards are hardware, software, and media independent, which support interoperability across heterogeneous technology environments. Backward compatibility of new technology neutral open standard format to existing ones or older ones enables migration of interoperable digital records over time.

Interview Observations: A number of agencies use technology neutral open standard formats such as PDF, HTML, JPEG, and TIFF. These potentially represent "preservation-ready" records if they are destined for transfer to a digital preservation repository (internal, external or State Archives repository).

Designated Community

The organization that has responsibility for preservation and access to permanent records is well served through proactive outreach and engagement with its Designated Community. Because needs and expectations change over time, this is an on-going process of engagement and documentation.

The Archives/Records Management unit has written procedures and formal agreements with records producing units that document the content, rights, and conditions under which the digital archival repository will ingest, preserve, and provide access to electronic records. The Archives/Records Management unit maintains written procedures regarding ingest of electronic records and access to its digital collections. Records Producers submit fully conforming ISO 14721 Submission Information Packages (SIPs) while Dissemination Information Packages (DIPs) are developed and updated in conjunction with its user communities.

North Dakota State Archives Score: Nominal (0)

Performance Metric: There is no written documentation that defines the rights, obligations, and responsibilities of record producing units or designated communities for electronic records held by the archival repository.

Rationale: Current State Archives procedures do not current address electronic records. The electronic records guidelines issued by ITD Records Management are outdated.

Interview Observations: Some of the agency staff interviewed were aware of the State Archives initiative to establish a digital preservation repository for permanent records of historical value. Some of the larger agencies identified business processes, applications, and repositories that house mission critical records and expressed interest in learning about and adopting good practices. Other interviewees acknowledged the need to update and strengthen their formal engagement with the State Archives to facilitate the transfer of archival records in a timely manner.

Electronic Records Survey

A trustworthy archival repository cannot fully execute its mission or engage in realistic digital preservation planning without a projected volume and scope of electronic records that will come into its custody. It is likely that some information already exists in approved retention schedules but may require further elaboration as well as periodic updates, especially with regard to preservation ready, near preservation ready, and legacy electronic records held by records producing units.

North Dakota State Archives Score: Minimal (1)

Performance Metric: The Archives/RM unit relies on existing retention schedules to identify electronic records of permanent historical, fiscal, and legal value in the custody of records producing units. The Archives/RM unit conducts ad hoc, one-time interviews or surveys to identify electronic records of permanent historical, fiscal, and legal value in the custody of selected records producing units.

Rationale: The State Archivist and the State Records Management Administrator are not routinely involved in digital information system implementation planning initiatives and so there is very little knowledge and documentation at the current time about how electronic records are being managed or stored. Mapping of records series to digital information systems or repositories is not routinely done by the Information Analysts during their work with agencies and local government units on the Records Retention Schedule, nor by other ITD personnel as part of system design, administration or management.

Interview Observations: Two lists were generated as part of the current assessment effort: 1) a list of 443 record series with permanent and 20+ year retention by agency, and 2) a 200+ page list of records series with permanent retention and/or a disposition requirement to Transfer to the State Archives. As part of the interview scheduling process the State Records Management Administrator asked agency Records Coordinators to identify whether the permanent and 20+ year retention records from their retention schedules were being retained in paper and/or electronic format. As expected the response demonstrated a hybrid environment, however the information is incomplete.

Following the interviews the State's EDMS Coordinator revisited the list and identified which of the record series are currently stored in the FileNet application. A list of permanent records stored in FileNet is provided later in this report. As acknowledged in the Digital Archives Study Request for

Proposal, no one in state government has an accurate assessment of what is necessary to successfully capture, preserve and provide on-going access to electronic records with historical or permanent value.

Digital Preservation Services

There are eight (8) key business process areas needed for continuous monitoring of external and internal environments in order to plan and take actions to sustain the integrity, security, usability and accessibility of electronic records stored in trustworthy digital repositories:

- Electronic Records Survey
- Ingest
- Archival Storage
- Media/Device Renewal
- Integrity
- Security
- Preservation Metadata
- Access

Ensuring the continuity of electronic records and enabling the design, operation, and management of digital preservation repositories requires the integration of people, processes, and technologies. The most complete trustworthy archival repository is based on models and performance criteria which include ISO 14721, ISO 16363, and generally accepted digital preservation operational practices.

In the March 7th Digital Preservation Capability Self-Assessment, the "repository" was assumed to be the North Dakota State Archives (not the FileNet or CONTENTdm repositories). NOTE: For the CoSA self-assessment which is based on the Digital Preservation Capability Maturity Model©, it was stipulated that organizations that do not have an ISO 14721 conforming repository in place could not score at the Advanced (3) or Optimal(4) level for the Digital Preservation Services components.

Ingest

A digital archival repository that conforms with ISO 14721/ISO 16363 has the capability to systematically receive and accept ("Ingest") electronic records from records producing units in the form of Submission Information Packages (SIPs), move them to a staging area where virus checks and content and format validations are performed, transform electronic records into designated preservation formats as appropriate, extract metadata from SIPs and write it to Preservation Description Information (PDI), creates Archival Information Packages (AIPs), and transfer the AIPs to the repository's storage function. This process is considered the minimal workflow for transferring records into a digital archival repository for long-term preservation and access.

North Dakota State Archives Score: Nominal (0)

Performance Metric: The State Archives does not currently accession or ingest electronic records.

Rationale: While the State Archives accepts electronic content from state agencies sent on CDs and DVD-Rs, the staff of the State Archives do not have the expertise or technical infrastructure to ensure the preservation of electronic records.

Archival Storage

ISO 14721 delineates systematic automated storage services that support receipt and validation of successful transfer of AIPs from ingest, creation of Preservation Description Information (PDI) for each AIP that confirms its "fixity" during any preservation actions through the capture and maintenance of error logs, updates to PDI, including transformation of electronic records to new formats, production of Dissemination Information Packages (DIPs) for Access, and collection of operational statistics.

North Dakota State Archives Score: Nominal (0)

Performance Metric: The Archives/RM unit only has access to primitive non-conforming archival storage (e.g., CDs/DVDs).

Rationale: The Archives accepts electronic content from agencies that is sent on CDs and DVD-Rs. A Nominal digital preservation capability score for Archival Storage reflects the reality that implementation of a trustworthy digital preservation repository for the State of North Dakota cannot begin until a policy framework and strategic roadmap is in place.

Device/Media Renewal

No known digital device or storage medium is invulnerable to decay and obsolescence. A foundational digital preservation capability is ensuring the readability of the bit streams underlying the electronic records. ISO 14721 specifies that a trustworthy digital repository's storage devices and storage media should be monitored and renewed ("refreshed") periodically to ensure that the bit streams remain readable over time. A projected life expectancy of removable storage media does not necessarily apply in a specific instance of storage media. Hence, it is important that a trustworthy digital repository have a protocol for continuously monitoring removable storage media (e.g., magnetic tape, external tape drive, or other media) to identify any that face imminent catastrophic loss. Ideally, this renewal protocol would automatically execute renewal after review by the digital archival repository.

North Dakota State Archives Score: Intermediate (2)

Performance Metric: Current practice mandates archival repository device/media renewal on a regularly scheduled basis.

Rationale: The State Historical Society relies on ITD to provide storage and hosting services and so their digital collections are subject to ITD practices and protocols which include periodic device and media renewal.

Integrity

A key capability in ISO 14721 conforming digital repositories is ensuring the integrity of the records in its custody, which involves two related preservation actions. The first action generates a cryptographic hash algorithm that normalizes any digital object regardless of size or content type to a fixed length bit stream (e.g., 156 bits). This fixed length bit stream is called a hash digest and it serves as a digital fingerprint. Depending upon the "strength" of the hash digest algorithm used, it is "computationally infeasible" for two different digital objects to have the same hash digest or to reconstruct a data object from this hash digest.

The second action involves integrity fixity that supports an unbroken electronic chain of custody captured in Preservation Description Information (PDI) in AIPs. Hash digests cannot support this chain of custody because migration to newer file formats will introduce changes in the underlying bit streams. Affixing a digital signature to an AIP that authenticates it after any preservation action will mitigate this issue. Over time digital signatures support a strong, unbroken chain of electronic custody.

North Dakota State Archives Score: Nominal (0)

Performance Metric: The archival repository has no documented procedure for integrity protection of electronic records in its custody.

Rationale: For the most part, the Archives does not store electronic records submitted by agencies on CDs and DVD-Rs on its servers. It does not have procedures for protecting the integrity of electronic records.

Security

Contemporary enterprise-wide information systems typically execute a number of shared or common services that may include inter-process communication, name services, temporary storage allocation, exception handling, role based access rights, security, backup and business continuity, and directory services, among others. An ISO 14721/ISO 16363 compliant archival repository is likely to be part of an information system that may routinely provide some or perhaps all of the core security, backup, and business continuity services including firewalls, role based access rights, data transfer integrity validations, logs for all preservation activities, including failures and anomalies to demonstrate an unbroken chain of custody.

North Dakota State Archives Score: Advanced (3)

Performance Metric: Currently, the archival repository does not have formal disaster recovery, backups, or firewall procedures in place to protect the security of electronic records.

Rationale: While the State Archives does not currently have an ISO 14721/ISO 16363 conforming digital preservation repository, its reliance on ITD for services and storage means that its existing electronic content is managed in accordance with ITD security, access and backup protocols.

Preservation Metadata

A digital archival repository collects and maintains metadata that describes actions associated with custody of permanent records including an audit trail that documents preservation actions carried out, why and when they were performed, how they were carried out and with what results. A current best practice is the use of a PREMIS-based Data Dictionary to support an electronic chain of custody that documents authenticity over time as preservation actions are executed. Capture of all related metadata, transfer of the metadata to any new formats/systems, and secure storage of metadata are critical. All metadata is stored in the Preservation Description Information (PDI) component of conforming ISO 14721 AIPs.

North Dakota State Archives Score: Nominal (0)

Performance Metric: Little or no preservation metadata is created, captured or maintained for electronic records.

Rationale: Neither the State Archives nor ITD Records Management currently have preservation metadata standards.

Access

Organizations with a mandate to support public access to permanent government records are subject to authorized restrictions. An ISO 14721 conforming digital repository will provide consumers with trustworthy records in "disclosure free" Dissemination Information Packages (DIPs) redacted to protect, privacy, confidentiality, and other rights where appropriate, and searchable metadata that users can query to identify and retrieve records of interest to them. Production of DIPs is tracked, especially when they involve extractions, to verify their trustworthiness and to identify query trends that are used to update electronic accessibility tools to support these trends.

North Dakota State Archives Score: Nominal (0)

Performance Metric: The archival repository has no capability to support access to electronic records in its custody.

Rationale: The State Archives does not have a conforming digital preservation repository that provides access to permanent electronic government records.

ITD Service Level Agreements and Billing Rates

ITD offers agencies several tiers of service and billing rates. For example, disk storage is available in different packages corresponding to performance and availability.

Table 1. ITD Disk Billing Rates

Service Type	Current Rate	Current One Time Fee	Budgeted Rate	Budgeted One Time Fee
Disk Storage – Premium (on demand)	1.25/GB		1.25/GB	
Disk Storage - Basic (on demand)	.80/GB		.80/GB	
Disk Storage - File Share (on demand)	.65/GB		.65/GB	
TSM Disk Backup	.15/GB		.15/GB	
Disk Storage – Premium (dedicated)	700.00/TB	7,835.00/TB	700.00/TB	7,835.00/TB
Disk Storage – Basic (dedicated)	600.00/TB	3,900.00/TB	600.00/TB	3,900.00/TB
Disk Storage - File Share (dedicated)	470.00/TB	5,500.00/TB	470.0/TB	5,500.00/TB

ITD appears to provide good guidance on file formats. The document format used most often was Adobe Portable Document Format (PDF). Images were usually recorded in Tagged Image File Format (TIFF). TIFF supports a number of compression formats, some of which are lossy and others which are lossless. Use of JPEG2000 and PDF/A appeared to be rare among the agencies interviewed for this study.

ITD operates a standby recovery data center located sufficiently far from the primary data center that an event would not remove both from service. The major threats in the area are tornados and flooding. In the event of a disaster declaration application processing would resume at the standby data center. The procedures for restoring service are regularly tested at the agency level, although FileNet, the enterprise document management application, is not part of the regular testing plan. FileNet has several prerequisite services; consequently it is not in the initial tier of applications to be restarted. FileNet has been excluded from regular Disaster Recovery (DR) exercises because its user base is multi-agency and DR exercises are currently run on an agency by agency basis

Standby systems are kept synchronized to the primary systems with storage-based mirroring.

Current Digital Repositories for Permanent Operational or Historical Records

North Dakota state agencies are operating a multitude of digital repositories for electronic government records. Some of these systems hold information assets of permanent value to the agencies, the State Archives, or both. The various rationales offered for use of repositories are representative of a forthright effort to provide quality service within the agency and/or to the public. The commitment of agency personnel who were interviewed for this study to create and operate digital repositories to accomplish their agency's mission was admirable.

Several examples of North Dakota digital repositories were chosen for a more detailed review in this section. FileNet is the primary electronic document repository; Peoplesoft HR is the State's system for managing financials, human resource information and student records; and Legend is the State Legislature's system for managing draft bills. All three of these systems are crucial to government operations and without them it would be difficult to conduct business. Each of these essential repositories is described, compared against prevailing records management (DoD 5015.2) and digital preservation (ISO 14721) standards, and ranked by level.

During the interviews conducted by Tournesol several agencies justified their independent operation of scientific and engineering repositories as being significantly different from the typical services offered by ITD. While it is true that geophysical and hydrologic data are distinct from routine business or financial records, the guiding principles of data governance are not so different. Tournesol focused on two scientific and engineering repositories as examples of successful cross-agency collaboration and planning.

FileNet Repository

North Dakota has standardized on a centralized implementation of IBM's FileNet application for the management of electronic documents. ITD maintains and administers FileNet. FileNet has a broad set of features to automate ingest, categorization, and manage record retention; however, most of those features are not currently in use. The typical methodology for agency users to register documents into FileNet is with a "drag and drop" style of user interface. The "drop" area chosen by a user indicates the type of document to be ingested.

Cost recovery for FileNet is based on a flat "per user" fee. A number of state agencies choose to license their entire staff because of their widespread usage of the application. Several agencies used the FileNet fee as part of their justification for retaining records within their own organization.

The FileNet application is certified as compliant[8] with the DoD 5015.2 standard[9] with the optional FileNet Records Manager 4.5 module (not installed at the State). IBM markets a different set of products that are intended for permanent digital repositories (i.e., ISO 14721 compliant). There are

[8] The Records Management Application (RMA) Registry is found at: http://jitc.fhu.disa.mil/cgi/rma/reg.aspx

[9] The current version of DoD 5015.02-STD, signed 25 April 2007, defines the basic requirements based on operational, legislative and legal needs that must be met by records management application (RMA) products acquired by the Department of Defense (DoD) and its Components and can be found at: http://jitc.fhu.disa.mil/cgi/rma/standards.aspx

many differences between FileNet and ISO 14721 standards (see Table 2). FileNet may appear to be an acceptable solution for the storage of records of long-term operational value, but ISO 14721 embodies several fundamental assumptions that distinguish a digital preservation repository for permanent records from an electronic document management system. Applications like FileNet were designed to manage documents over a record's lifecycle, from creation (or capture) to their eventual expiration and destruction. A digital preservation repository requires a continuum of care approach; the repository is intended to preserve and transform a digital object to ensure continuity as technology changes over time.

Tournesol characterizes the state's FileNet implementation as a "Level-2" digital repository. With the Records Manager component installed and implemented to conform to the state's Records Retention Schedules, it would be a "Level-3" digital repository.

Table 2. FileNet Compared to ISO 14721 Conforming Repository

Preservation Services	***FileNet P8 (non DoD 5015.2 Compliant)***	***Conforming ISO 14721 Digital Preservation Repository***
1.INGEST Submission Information Package (SIP)		
a. Record Producer	Partial	Yes
b. Fixity (Integrity)	No	Yes
c. Technology Neutral	No	Yes
d. Transformation	No	Yes
e. Metadata	Partial	Yes
2. ARCHIVAL STORAGE Archival Information Package (AIP)		
a. Migration to new Technology Neutral Preservation Formats	No	Yes
b. Fixity (Integrity)	No	Yes
c. Device/Media Renewal	Yes	Yes
d. Preservation Metadata	No	Yes
3. Security		
a. Password	Using LDAP	Yes
b. Backup/Data Recovery	Using TSM	Yes
4. ACCESS Dissemination Information Package (DIP)		
a. Public Access	No	Yes
b. Redaction	No	Yes

No statistics were available to breakdown the percentage of scanned documents (e.g., PDF and TIF images) compared to "born digital" documents currently held in FileNet. Several agency representatives indicated they have programs to scan their backlog of paper records (often from the time of Dakota Territory). The ambiguity of what was the authoritative record when scanned records were involved was the subject of several discussions with agency staff. In some cases paper records were scanned to reduce storage space (with the paper being shipped to the State Historical Society). In other instances

records were scanned to simplify the search and retrieval process. At least one organization handles email by printing the email, scanning the email, and then ingesting the email into FileNet.

Table 3 below shows that as of January 27, 2014, FileNet was managing more than 66 million documents. This represents a growth rate of 8.39% from the previous year. The rate of growth of FileNet storage was slightly more than twice that (17.05%) of the document growth rate. FileNet currently manages almost nine terabytes of state government records.

Table 3. FileNet Documents by Agency (Year to Year Comparison)

Agency	January 27, 2013		January 27, 2014		Annual Size Change (%)	Annual Document Count Change (%)
	Size (GB)	Document Count (1000's)	Size (GB)	Document Count (1000's)		
Bank of ND	0.01	31.57	0.01	38	-10.97	16.78
Commerce	11.97	24.47	13.28	27.22	9.85	10.10
ConnectND	2.14	7.47	2.14	7.47	0.00	0.00
Corrections	182.52	713.10	214.54	875.61	14.93	18.56
DFI	110.45	29.50	155.65	34.11	29.04	13.50
DHS	1,329.08	7,879.40	2,042.84	9,073.61	34.94	13.16
DOH	5.97	101.91	5.97	101.91	0.00	0.00
DOT	1,429.69	16,826.03	1,611.28	17,528.05	11.27	4.01
ESPB	16.32	151.55	17.18	162.30	4.98	6.62
Highway Patrol	1.36	90.84	1.37	92.02	1.29	1.28
Insurance	23.43	109.27	30.24	125.54	22.51	12.96
ITD	24.02	580.88	24.38	655.28	1.47	11.35
JSND	302.40	5,548.45	337.85	6,198.17	10.49	10.48
OMB	16.41	78.47	18.03	85.92	8.97	8.67
PERS	221.65	1,350.40	227.67	1,482.73	2.64	8.93
RIO	11.09	211.71	12.19	226.73	9.00	6.62
SOS	98.49	705.83	120.37	761.39	18.17	7.30
State Land Dept	19.31	91.95	22.35	98.17	13.63	6.33
TAX	1,730.39	7,833.10	1,850.84	8,492.17	6.51	7.76
VET	1.77	9.96	45.91	123.25	96.14	91.92
WSI	1,756.42	18,363.11	2,040.17	20,109.64	13.91	8.69
Total	7,294.91	60,738.98	8,794.26	66,299.22	17.05	8.39

FileNet has been built into the workflow of many state agencies. Thus it was unexpected to discover that FileNet is not a "First Tier" system scheduled for recovery during a disaster. The State maintains a recovery data center and replicates data from its primary data center to the recovery data center using a variety of tools; however, because of FileNet dependencies on other systems it is not considered to be among the first systems required to restore service after a disaster. Tests of the recoverability of the FileNet environment were also an issue: because so many agencies depend on FileNet services, scheduled Agency-specific Disaster Recovery (DR) tests exclude FileNet services. That issue was understood by ITD and remedies are being considered for future DR tests.

PeopleSoft Repository

PeopleSoft was acquired by Oracle in 2005 and its Human Resource Management Systems (HRMS) is the market leader. In addition to HR software, the PeopleSoft brand includes Financials and Supply Chain Management (FSCM) and Customer Relationship Management (CRM). North Dakota's PeopleSoft implementation pre-dates the acquisition by Oracle and the PeopleSoft database is hosted by Microsoft SQL Server rather than an Oracle database. None of the PeopleSoft brand is certified as DoD 5015.2 compliant. Oracle markets add-on products to fulfill that niche.

PeopleSoft is representative of a database approach to a digital repository as displayed in Figure 2 below. Despite the fact that records stored in the PeopleSoft database are a logical aggregation of fields spread across many tables, the complexity of managing records in such an environment is no different from physical records contained in a sequential file. In other words, a Records Administrator accustomed to associating a report or file to a record series would need to rely on Structured Query Language (SQL) to define the database equivalent. Since updated electronic records guidelines are not available to agency Records and IT Coordinators however, it is unlikely that the full range of recordkeeping requirements for state records stored in the PeopleSoft repository are being met.

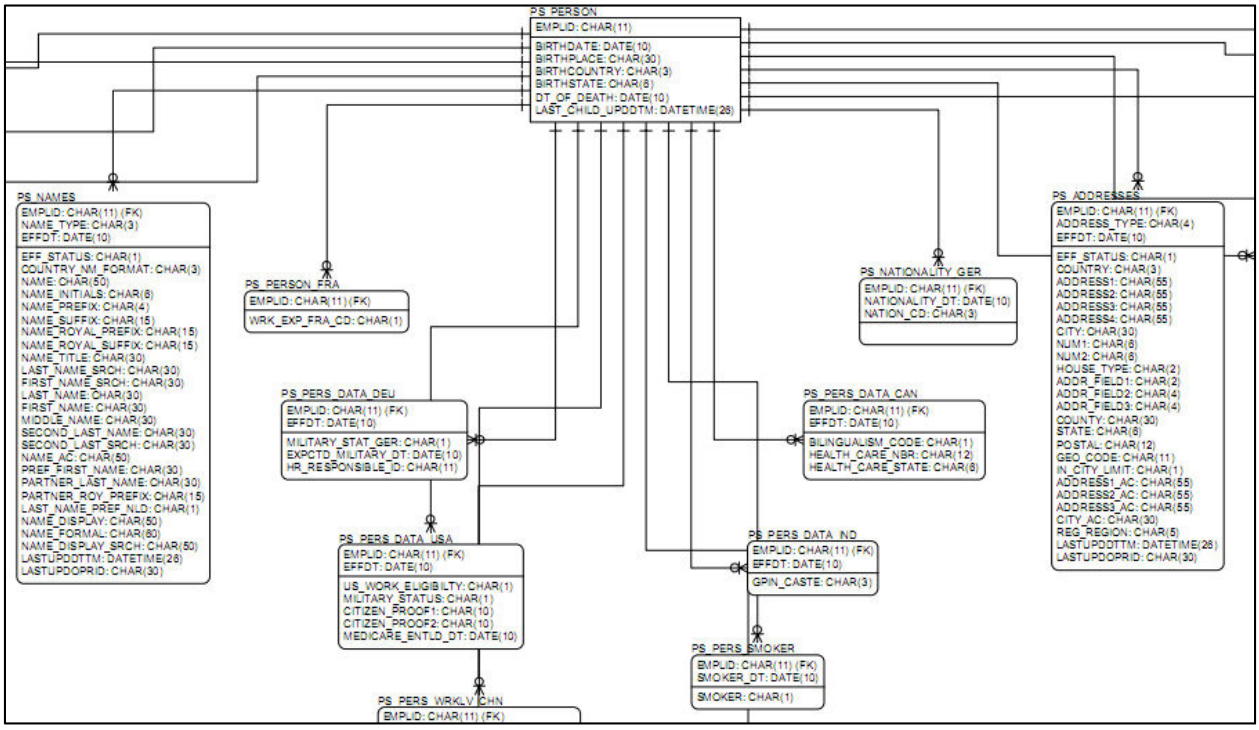


Figure 2. PeopleSoft Entity-Relationship Diagram Exhibiting Logical Field Relationships

The state's PeopleSoft implementation uses database tiering (commonly called "database archiving" in the database community) to transfer less frequently used data out of the active database. Moving less frequently used information to a separate repository allows the information to be retained, generally on a larger, less expensive device albeit with a longer response time.

The PeopleSoft database and application servers are backed up and replicated using IBM XIV mirroring technology to the disaster recovery data center. PeopleSoft services are not considered first tier applications for recovery but they are a priority.

FileNet is the primary repository for records outputs produced by PeopleSoft. Oracle markets add-on products that perform similarly to FileNet in terms of a document repository.

Table 4 below compares PeopleSoft HR to the capabilities of an ISO 14721 digital preservation repository. Tournesol characterizes the state's PeopleSoft HR implementation as a "Level-2" digital repository.

Table 4. PeopleSoft Compared to ISO 14721 Conforming Repository

Preservation Services	***PeopleSoft HR***	***Conforming ISO 14721 Digital Preservation Repository***
1.INGEST Submission Information Package (SIP)		
a. Record Producer	No	Yes
b. Fixity (Integrity)	No	Yes
c. Technology Neutral	No	Yes
d. Transformation	No	Yes
e. Metadata	No	Yes
2. ARCHIVAL STORAGE Archival Information Package (AIP)		
a. Migration to new Technology Neutral Preservation Formats	No	Yes
b. Fixity (Integrity)	No	Yes
c. Device/Media Renewal	No	Yes
d. Preservation Metadata	No	Yes
3. Security		
a. Password	Using LDAP	Yes
b. Backup/Data Recovery	Using TSM	Yes
4. ACCESS Dissemination Information Package (DIP)		
a. Public Access	No	Yes
b. Redaction	No	Yes

Legend Repository

Legend was developed by Propylon for legislative bill draft management. Its major focus is version control so that legislators can create, change, and review legislation. Propylon's CTO (Sean McGrath) described the design approach as "It's all about audit-trail" and "it isn't record centric or series-centric." Propylon creates products for digital archives that are ISO 14721 and ISO 16363 compliant, but Legend was intended to satisfy a different end user requirement.

Legend is neither DoD 5015.2 nor ISO 14721 compliant; however, as previously stated, that was not a design consideration. Tournesol characterizes Legend as a "Level-2" digital repository. Legend has strong controls to retain metadata and versions of bills. Once a bill is enacted into law it remains in Legend instead of being transferred to a permanent digital preservation repository. Table 5 below shows a comparison of Legend to an ISO 14721 digital preservation repository

Table 5. Legend Compared to ISO 14721 Conforming Repository

Preservation Services	***Legend (Legislative Bill Drafting)***	***Conforming ISO 14721 Digital Preservation Repository***
1.INGEST Submission Information Package (SIP)		
a. Record Producer	No	Yes
b. Fixity (Integrity)	No	Yes
c. Technology Neutral	No	Yes
d. Transformation	No	Yes
e. Metadata	Yes	Yes
2. ARCHIVAL STORAGE Archival Information Package (AIP)		
a. Migration to new Technology Neutral Preservation Formats	No	Yes
b. Fixity (Integrity)	No	Yes
c. Device/Media Renewal	No	Yes
d. Preservation Metadata	No	Yes
3. Security		
a. Password	Using LDAP	Yes
b. Backup/Data Recovery	Using TSM	Yes
4. ACCESS Dissemination Information Package (DIP)		
a. Public Access	Yes	Yes
b. Redaction	No	Yes

Scientific and Engineering Repositories

Several agencies operate repositories of permanent records using local agency resources instead of ITD resources. Oil and Gas, State Water Commission, Public Service Commission, State Trust Lands, and other agencies collect and maintain aerial photography, geophysical data, well logs, and other information with extremely long term or permanent retention requirements. Most agencies that operate these records repositories considered their entire content (past and current) to be operational

information that must be retained in perpetuity in their custody, unsuited for transfer to the State Historical Society.

The distinguishing feature of these types of records is that specialized analysis and modeling tools are generally required to make use of these data. That distinction was the basis of agency justification for their segregation from ITD managed systems. The assertion that these forms of data are significantly different and need to be maintained by their local agencies fails to consider that the origin of ISO 14721 was the Open archival information system (OAIS) reference model for scientific (space data systems) information. ISO 14721 was designed to be applicable to any organization with responsibility for making information accessible long term. Consolidated repositories generally improve the usability of information.

The GIS Technical Committee (discussed in the next section) has helped guide these agencies to engage in a valuable collaborative effort to promote information sharing between and among state agencies and the public.

Two Examples of Collaborative Repositories

Two State of North Dakota efforts exemplify work to maximize the value of permanent information assets. The Geographic Information System (GIS Hub) and the State Longitudinal Data System (SLDS) both integrate multiple information sources. These collaborative efforts often depend on information collected over years, decades, or generations. The success of initiatives such as the GIS Hub and SLDS depend on understanding and identifying as early as possible the preservation needs of the information being collected. The Governance section of this report identified special issues these two projects encountered.

GIS Hub

The State of North Dakota's GIS Hub represents one of the best examples of collaborative efforts to establish and operate a digital repository that preserves and provides access to an on-going blend of current and historical information. The GIS Technical Committee (GISTC) actively enhances the GIS Hub by adding new data and maintaining existing data such as high-resolution elevation data, aerial photography, and work force lodging. The GIS Hub also supports web-based applications that are available via PC or a mobile device. Information feeds may be derived from permanent and historical information (e.g., decades-old aerial photography now scanned and digitized) and matched with mobile positioning systems or other contemporary digital information.

During the 2012-2013 reporting period there were over 5.1 million hits on the web services, a 61% increase over the previous reporting period. There are more than 234 database layers and other GIS datasets on the GIS Hub which consume about 13 terabytes of storage or the equivalent of over 2,765 DVDs.

State Longitudinal Data System

The State Longitudinal Data System (SLDS) contains information about all elementary and secondary public districts and schools in North Dakota, including individual student and staff records. Pre-kindergarten programs are included for public districts that have approved programs. All students receiving special education services including early intervention through age 21. Private schools and Bureau of Indian Affairs schools may be included for entities reporting to the state.

The SLDS was created for the purpose of providing data needed to support data-driven, decision making and to facilitate state and federal reporting, including for the federal *No Child Left Behind Act.* The SLDS is managed by the Information Technology Department (ITD) as outlined in North Dakota Century Code (15.1-02-18), ITD "shall maintain a statewide longitudinal data system among education, workforce, and training entities."

ITD works in partnership with the agencies/entities contributing data to the SLDS which include the Department of Public Instruction (DPI), North Dakota University Systems (NDUS), Workforce Development and the school districts. ITD acts in accordance with federal laws, such as the federal Family Educational Rights and Privacy Act (FERPA) and the Individuals with Disabilities Education Act (IDEA, 34 CFR §§ 300.127 and 300.560-300.576), and ND statutes and regulations (e.g., Sections 15.1-02-08,09,10,13,18). All of these laws and policies are essential to maintaining the confidentiality of student records as they are collected and as they are maintained within the SLDS.

The SLDS maintains kindergarten through Grade 12 educational records over a period of many years for reference and analysis. The governance of this information is being handled by the SLDS team.

Email Repository and Cloud-Based Repository under Development

Two additional repositories are described here for illustrative purposes. The first repository is the central email system that is used by every state employee and holds both transitory and long-term state government records. The state does not currently have archiving capabilities within the Exchange application.

The State of North Dakota has joined a consortium to develop a cloud-based repository to support Unemployment Insurance processing and reporting requirements. The lead agency, Job Services, is also noteworthy because nearly all of its funding comes from the federal government.

Exchange as an Ad Hoc Repository

Email is regarded as an essential service to both government and industry. Within North Dakota state government operations the management, retention and preservation of email correspondence is at the discretion of the employee. In some offices where correspondence must be preserved, email and unstructured documents are reportedly printed, scanned to PDF, and ingested into FileNet.

Size limitations on Exchange mailboxes have resulted in the use of a variety of tactics by state employees to retain emails in excess of the Exchange server limits. PST files are stored on network

shares, and even PSTs moved to employee workstations are commonplace. Management seems to condone these tactics even in the absence of standards, consistency, or security controls.

WyCAN Repository

The 2013-2015 ITD Strategic Plan indicates that cloud computing is one of two emerging technologies that are organizational priorities. A cloud-based system that is currently under development for Job Services North Dakota is WyCAN. Although the records managed in WyCAN do not have permanent retention, this repository is included as an example of an outsourced records management approach.

The WyCAN Consortium expects to develop a common, integrated Unemployment Insurance (UI) benefits and Tax IT System. This system will interface with supporting applications and agencies and will include the conversion of historical UI data of each WyCAN State and training for each WyCAN State's end users and administrators in system operations. The deployed system is expected to facilitate system changes and enhancements as well as the adoption of additional future WyCAN State participants.

The WyCAN Consortium requires a compliant, modified Software-as-a-Service ("SaaS") operating model. This type of software platform is expected to provide both Consortium and vendor benefits including:

- On demand platform and elasticity for peaks and valleys
- Configurable System that can be self-managed
- Delivers product features seamlessly and ensures that System updates and maintenance are continuously improved
- Greater reliability
- Removes state reliance on state technical resources and allows business to manage program via Service Level Agreements

Figure 3 identifies the high-level interaction characteristics with WyCAN. No information was available describing the transaction rates, data retention characteristics, or other potential permanent or historic records requirements that might be unique to North Dakota.

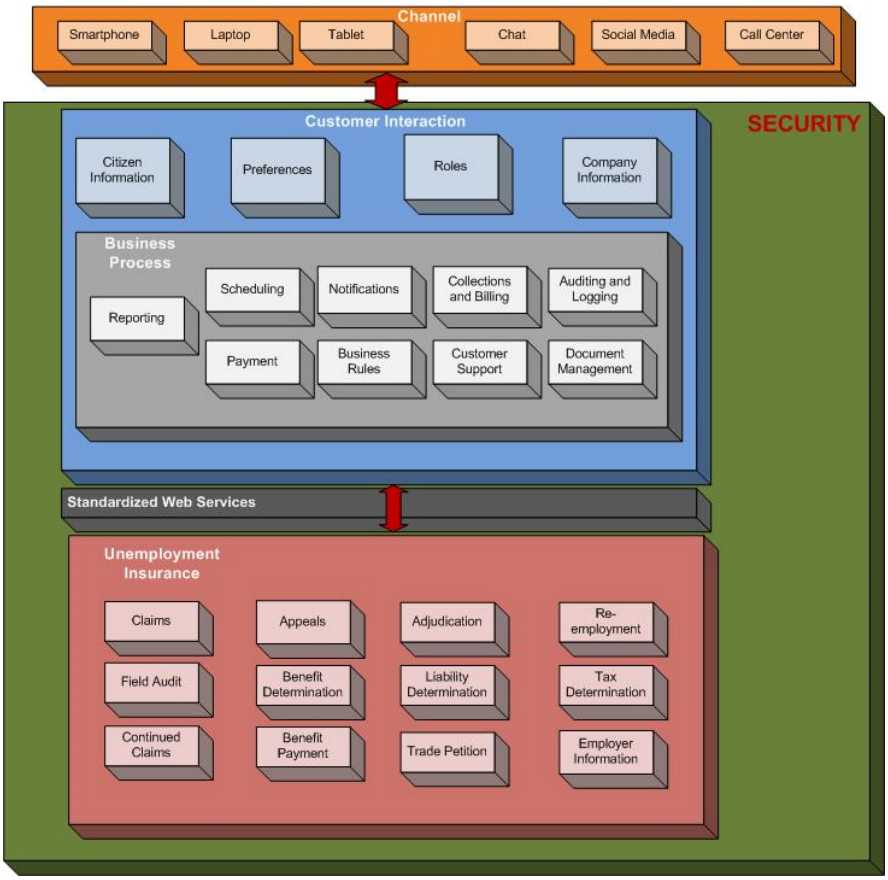


Figure 3. WyCAN Standard Component Architecture (Source: WyCAN UI System Build and Maintenance; RFP Number RFP-007-PVR-12)

A modernized UI Benefits and Tax IT System is expected to enable WyCAN participants to be more responsive to evolving customer needs and expectations and reduce system maintenance and technology refresh costs. The fundamental tenets of the Consortium are:

1. Leverage the inherent commonality between the WyCAN States to reduce the development costs relative to the collective development costs of four separate states.
2. Pool resources and skills among the WyCAN States to promote success in all phases of the project.
3. Exploit Open Source and Commercial-off-the-Shelf ("COTS") products and methods where appropriate to reduce risk and lower both short- and long-term costs.
4. Build a core System that can be easily extended to additional states to the mutual benefit of the Consortium and its vendor partners.
5. Incorporate industry best practices for software development that follow iterative approaches.
6. Build a System that allows state business staff and administrators to make changes through configuration from the parameter to component level without IT assistance.
7. Create an operations and support model that promotes delivery of upgrades and enhancements to the Consortium in a high-quality, timely, cost-effective, and equitable manner.
8. Allow vendors the opportunity to create a sustainable and extensible platform that promotes reusability, product innovation, and scalability by using innovative concepts, specifically Software-as-a-Service provided in a manner that meets compliance requirements and the needs of a government setting with funding constraints.

Current Staffing Resources for Data, Document and Records Management

All employees of the State are engaged to some extent in management of government data, documents and records. For example, although the backlog of paper documents is shrinking, hundreds of state employees were engaged in scanning documents. As previously stated, email preservation is a personal responsibility; thus, virtually every employee had an obligation to be trained and to manage his or her email. At the enterprise level there are three dedicated Records Management resources (two analysts and an administrator).

The GIS Technical Committee and the State Historical Society have both demonstrated the need for additional staffing for data preservation activities.

The Enterprise Architecture team for Document Management consists of a group of 16 people. At least two individuals on the team are full-time personnel supporting records, documents and systems.

Table 6. Enterprise Architecture Team for Document Management

Name	Agency
Chuck Picard (Team Leader)	Information Technology Department
Steve Barreth	Dept. of Transportation
Nathan Blowers	Information Technology Department
Colette Bosch	Job Service ND
Agnes Bryant	Information Technology Department
Eli Cornell	Information Technology Department
Linda Gregoryk	Secretary of State
Dan Jacobsen	Dept. of Mineral Resources
Becky Lingle	Information Technology Department
Cindy Lyn	Job Service ND
Darin Meschke	Department of Health
Mandy Nagel	Attorney General
Richard Nagel	Retirement & Investment Office
Judy Ortlip	Department of Public Instruction
Arnie Seitz	NDPERS
Tina Walters	Department of Human Services

The State Longitudinal Data System Executive Steering Committee monitors the health of the project and reviews all project decisions. The amount of effort expended on evaluating the retention of records is likely to be minimal; however, decisions about the acquisition, value, and management of information assets are very likely to be within their purview.

Table 7. State Longitudinal Data System Executive Steering Committee

Name	Title	Affiliation
Mike Ressler	Chief Information Officer	Information Technology Department
Lisa Feldner	Chair	Vice Chancellor for IT and IR, North Dakota University System
Justin Data	Large Project Oversight Analyst	Information Technology Department
Tracy Korsmo	Business Intelligence Architect	Information Technology Department
Pam Sharp	Director	Office of Management and Budget

The GIS Technical Committee consists of the following participants:

Seven Agencies listed in the Executive Order

- Department of Health
- Department of Transportation
- Game & Fish Department
- Geological Survey
- Information Technology Department
- Parks & Recreation Department
- State Water Commission

Associate Members

- Department of Trust Lands
- Oil & Gas Division
- Public Service Commission
- Department of Emergency Services
- Department of Agriculture

The GIS Technical Committee has spent a considerable amount of time considering the value of its information assets and the cost of creating a preservation repository. The GID Digital Archive Working Group (GDAWG) studied the issues of preservation and some of its conclusions are contained in the GIS Strategic Plan.

Electronic Records Volumes and Projections

The rate of growth of records stored in FileNet from January 2013 to January 2014 was 8.39% as show in Table 3. FileNet Documents by Agency (Year to Year Comparison). Breaking down that growth rate for permanent records in the repository has proved to be more difficult. Table 8. Permanent Records Managed by FileNet identifies permanent records by agency that are stored in FileNet.

Table 8. Permanent Records Managed by FileNet (Source: EDMS Administrator)

AGENCY	RECORD CONTROL NUMBER	RECORD SERIES TITLE	MEDIA
Secretary of State	700102	City Corporations	Paper
Secretary of State	800221	Registered Agent	Paper/Electronic
Secretary of State	800338	Airport Authorities	Paper
Secretary of State	800340	Domestic Corporations	Electronic
Secretary of State	800343	Municipal Power Agency	Paper
Secretary of State	800344	Limited Partnership Certificates	Paper/Electronic
Secretary of State	800345	State Banks	Paper/Electronic
Secretary of State	800350	Foreign Corporations	Paper/Electronic
Secretary of State	800353	Church Corporations	Electronic
Secretary of State	800382	Nonprofit Articles of Incorporation	Electronic
Secretary of State	800395	Limited Liability Partnership Registrations	Electronic
Secretary of State	800396	Limited Liability Limited Partnership Certs	Paper/Electronic
Secretary of State	800397	Real Estate Investment Trust Registrations	Electronic
Office of Management & Budget	800378	Class Specifications and Histories	Electronic
Public Employees Retirement	220303	Employer Participation Agreements & Minutes	Electronic-FileNet
Education Standards and Practices Board	800349	Teacher Licensee Files	Electronic-FileNet
State Trust Lands	720202	Card File to all Sate Owned Land (301099)	Paper/Electronic-FileNet
State Trust Lands	800318	Patent Books (301510)	Paper/Electronic-FileNet
State Trust Lands	800331	Surface Land Files (301068)	Paper/Electronic-FileNet
State Trust Lands	720301	Index to Bank Land Files (800502)	Paper/Electronic-FileNet
Department of Financial Institutions	260201	Corporate Existence of State Banks	Paper/Electronic
Department of Transportation (DOT)	900407	Crash, Traffic & Safety Data Reports	

AGENCY	RECORD CONTROL NUMBER	RECORD SERIES TITLE	MEDIA
DOT	720414	County CMC Routes	
DOT	300117	Wetland Delineation and Mitigation	
DOT	501201	Environmental Statements	
DOT	800312	Right of Way Project Files	
DOT	300145	TERO Agreements	
DOT	650307	Supplemental Specifications	
DOT	650715	Standard Specifications	
DOT	950107	Original Standard Drawings	
DOT	300115	Utility Relocation Agreements – Interstate Highways	
DOT	950154	Railroad Plats	
DOT	801321	County Structure Screened for Analysis	
DOT	801367	Problem/Complaint Drainage Files	
DOT	800207	Abstract of Bid Opening	
DOT	220323	Core Meeting Minutes	
DOT	650106	Policy/Procedure Manual	
DOT	650603	Decision Documents	
DOT	700101	Country General Files	

Appendix D includes a breakdown of document types by agency stored in FileNet as of January 7, 2013.

During the 2012-2013 reporting period there were over 5.1 million hits to GIS web services, a 61% increase over the previous reporting period. There are more than 234 database layers and other GIS datasets on the GIS Hub which consume about 13 terabytes of storage or the equivalent of over 2,765 DVDs.

Current Access Rates for State Historical Society Digital Resources

The State Historical Society operates a website that provides access to photographs, maps, digitized newspapers, and other information of historical interest. The amount of content on the website is relatively small because transfer procedures for electronic records from State agencies have not yet been authorized. Figure 4 shows website traffic on a daily basis from July 1, 2012 to June 30, 2013. Table 8 breaks down that traffic by collection within the website.

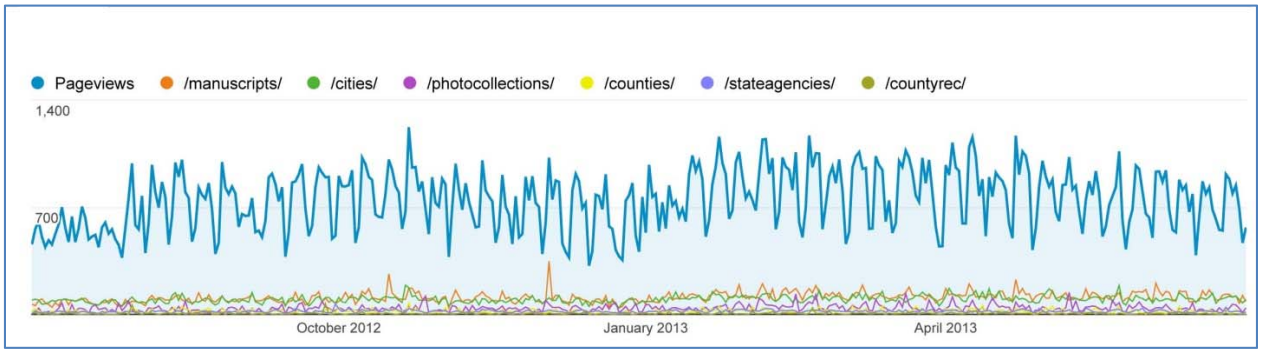


Figure 4. Website Traffic (Source: Google Analytics - July 1, 2012 - June 30, 2013)

Viewed Collection	Pageview Count	Percent of Total Pageviews	Unique Pageview Count	Percent of Total Unique Pageviews	Avg. Time on Page (HH:MM:SS)
/genresearchsources.html	46,813	16.67%	4,639	2.56%	0:02:26
/manuscripts/	40,500	14.42%	33,222	18.34%	0:01:59
/cities/	36,181	12.88%	29,939	16.53%	0:01:47
/index.html	27,604	9.83%	20,212	11.16%	0:00:42
/photocollections/	14,744	5.25%	9,908	5.47%	0:00:42
/genealogy.html	9,571	3.41%	6,545	3.61%	0:00:40
/counties/	7,863	2.80%	4,716	2.60%	0:00:14
/genatlas.html	7,550	2.69%	4,001	2.21%	0:00:42
/stateagencies/	7,171	2.55%	6,285	3.47%	0:02:12
/genmarriage.html	6,773	2.41%	4,619	2.55%	0:01:47
/whatphotos.html	6,692	2.38%	4,187	2.31%	0:08:46
/whatnewspapers.html	6,499	2.31%	4,538	2.51%	0:00:40
/newsndpapers.html	4,616	1.64%	2,816	1.55%	0:00:20
/onlinelibrary.html	4,391	1.56%	3,514	1.94%	0:01:35
/datanaturalization.html	3,971	1.41%	3,158	1.74%	0:03:46
/genlandrecords.html	3,460	1.23%	2,577	1.42%	0:00:32

Table 9. Website Traffic (Source: Google Analytics - July 1, 2012 - June 30, 2013)

Current Practices for Authentication and Authorization

The authentication of users to State resources (including FileNet) is managed with Microsoft Active Directory. Authorization to manipulate permanent records depends on where records are located. Records can be ingested into FileNet by licensed users, but controls have been instituted to prevent the deletion of records without administrative authorization.

Records maintained in network file shares (e.g., case management systems) are accessible to business groups. In some of the interviews with State agencies there was "relative" indifference regarding the issue of authenticity in that they assumed that all necessary measures and controls were in place.

The Legislative Council and State Supreme Court are both concerned with issues of authenticity for the records they manage. Legend (the Legislature's bill drafting system) focuses on capturing and recording changes to draft legislation. The Supreme Court moved to digital records some time ago and has instituted procedures to protect submissions.

The extent of efforts to ensure authenticity is still to be determined across North Dakota State systems.

Appendix A: Source Materials Reviewed for Digital Archives Study as of March 17, 2014

Resource	Relevant Dates	Description	Received From	Format	Transmitted
Interview Contact List	Updated through on-site visit	List of state employees who participated in interviews for the study	BLINGLE	MS Excel	Email
SHS High Level Business Analysis	Published 7/1/2010	Prepared by ITD	AJENKS	Paper	
ND SERI Self-Assessment Report	Published 6/1/2013	Digital Preservation Capability Self-Assessment results - Score 16/60	AJENKS	PDF	Email
20120614 North Dakota SERI Self Assessment	Published 6/1/2012	Digital Preservation Capability Self-Assessment results - Score 9/60	AJENKS	PDF	Email
SERI Assessment Demographic Answers		Re-created by Ann; relates to conformance, repositories and collaborative engagement	AJENKS	PDF	Email
SHS Organizational Chart	Dated September 2013		AJENKS	PDF	Email
EDMS Disk Storage	2/27/2014	FIleNet Storage by Agency and Document Class	CPICARD	MS Excel	Email
Inventory of Geological and Geophysical Data Completed at NDGS		DMR Newsletter Vol 35. No 2	Oil & Gas	Paper	Interview
Permanent State Agency Records	Received 2/25/2014	List of Records Series from State Retention Schedules that have Disposition: Transfer to Archives	AJENKS	Word and Paper	
State Agency Accessions Statistics by month	Jan 2011 - Dec 2013	Series and Cubic Feet	AJENKS	Paper	
Archives Access Statistics	7/1/2012 to 6/30/2013	Activities and statistics organized by: Reference, Preservation, Access, Records Management	AJENKS	PDF	Email
Archives Web Analytics	Received 2/19/2014		AJENKS	PDF	Email
Enterprise EDRM Position Description (paragraph)		From recent JDQ	CPICARD		Email
List of Agencies Using FileNet	Received 2/18/2014		CPICARD		Email
Information Management Analyst Position Description			BLINGLE	PDF	Email

Resource	Relevant Dates	Description	Received From	Format	Transmitted
ITD Organizational Chart	Dated January 14, 2014		BLINGLE	PDF	Email
ND Capitol Building Basement Vaults	Received 2/25/2014		AJENKS	PDF	Email
North Dakota Heritage Center Expansion Fast Facts	Current	SHS Collections Statistics		Paper	
State Records System Administrator Position Description	Current - Position 1255		BLINGLE	PDF	Email
RM 1000 Data Archival		List of permanent records by agency - see list of all series with 'Transfer to Archives' disposition provided by AJenks	BLINGLE	MS Excel	
State Archives 2013 Workplan			AJENKS	Word	
State Agency e-Records in State Archives		Description of materials sent in electronic format to the State Archives	AJENKS	Word	
List of Statutes relating to records management and archives			BLINGLE	Email	
Inbound to SHS Transfer Statistics	Fiscal Year 2013	Inbound transfer statistics and Current state capabilities; Current digital storage; business continuity plan	AJENKS	Email	
SHS Job Classes	Current	List of SHS staff by job class Management Services	AJENKS	Email	
Courts Records Management	Received 2/27/2014	Supreme Court Administrative Rules and Orders	AJENKS		Email with link
Dept of Transportation EDMS Disk Storage Usage	Received 2/27/2014	17,522,206 documents; 1.6 TB	Treva Beard	Ms Excel	Email with attachment
Water Commission Presentation on changing infrastructure and information management plan	Delivered to staff in early 2008	Converted to Youtube; email cover describes changes that have taken place since 2008 launch	Chris Bader		Email with link
CoSA's Response to the NHPRC's Proposed Grant Guidelines Changes	Received 2/27/2014	Link to proposed changes and PDF CoSA response letter	AJENKS	PDF	Email with attachment
Retention Schedule Management Process - forms and samples	Received 2/27/2014	Overview and samples	BLINGLE AJENKS	Paper	Interview

Resource	Relevant Dates	Description	Received From	Format	Transmitted
Legislative Council - Document types, Electronic information, URL	Received 2/25/2014			Paper	Interview
GeoMAPP_FinalReport_final_20111231	Dec-11	GeoMAPP Project Final Report	Bob Nutsch	PDF	Emailed Zip
NDSA_AppraisalSelection_report_final102413	Oct-13	ISSUES IN THE APPRAISAL AND SELECTION OF GEOSPATIAL DATA	Bob Nutsch	PDF	Emailed Zip
GDAWG Imagery and Elevation Data Management Guidelines	Apr-12	Imagery and Elevation Data Management Guidelines DRAFT	Bob Nutsch	MS Word	Emailed Zip
GeoMAPP_ProjectFindings_BestPractices20111231	Dec-11	GeoMAPP Key Findings and Best Practices	Bob Nutsch	PDF	Emailed Zip
DataInventory5	Apr-12	GIS Data Inventory	Bob Nutsch	MS Excel	Emailed Zip
2013-2015-ITD strategic-plan	2013-2015	ITD Strategic Plan		PDF	ITD Website
2012-2013-annual-report	2012-2013	ITD Annual Report		PDF	ITD Website
Billing _ ITD.pdf	Current	ITD Billing Information		PDF	ITD Website
Data Processing Rates _ ITD.pdf	Current	ITD Staffing Rates		PDF	ITD Website
Micrographics Rates _ ITD.pdf	Current	ITD Micrographic Rates		PDF	ITD Website
Rate Descriptions _ ITD.pdf	Current	ITD Rate Descriptions		PDF	ITD Website
Telecommunications Rates _ ITD.pdf	Current	ITD Telecommunication Rates		PDF	ITD Website
Viewing Billing Invoices and Reports _ ITD.pdf	Current	Guide to Viewing ITD Reports		PDF	ITD Website
Budget Detail 2013-2015.pdf	2013-2015	Budgets by Agency		PDF	OMB Website
fiscaladmin2013.pdf	Current	Fiscal Administration Policies		PDF	OMB Website
HRPolicyManual.pdf	Current	HR Policies		PDF	OMB Website
ICQguidelinesOMB.pdf	Current	Internal Control Guidelines		PDF	OMB Website
RiskPolicyManual.pdf	Current	Risk Mgt Policies		PDF	OMB Website
Desktop Support Service Level Agreement _ ITD.pdf	Current	Desktop Support Service Level Agreement		PDF	ITD Website
Email _ ITD.pdf	Current	Email Service Level Agreement		PDF	ITD Website

Resource	Relevant Dates	Description	Received From	Format	Transmitted
Project Management Service Level Agreement _ ITD.pdf	Current	Project Management Service Level Agreement		PDF	ITD Website
Service Level Agreements _ ITD.pdf	Current	Service Level Agreements General Info		PDF	ITD Website
sla-datacenter-space-rental.pdf	Current	Datacenter-space-rental Service Level Agreement		PDF	ITD Website
sla-enterprise.pdf	Current	Enterprise Service Level Agreement		PDF	ITD Website
sla-hosting.pdf	Current	Hosting Service Level Agreement		PDF	ITD Website
Application Development Methodology _ ITD.pdf	Current	Application Development Methodology _ ITD		PDF	ITD Website
Database Security Best Practices _ ITD.pdf	Current	Database Security Best Practices _ ITD		PDF	ITD Website
Databases _ ITD.pdf	Current	Databases _ ITD		PDF	ITD Website
Document Management _ ITD.pdf	Current	Document Management _ ITD		PDF	ITD Website
E-Services Privacy _ ITD.pdf	Current	E-Services Privacy _ ITD		PDF	ITD Website
E-Services Security _ ITD.pdf	Current	E-Services Security _ ITD		PDF	ITD Website
Electronic Data Backup _ ITD.pdf	Current	Electronic Data Backup _ ITD		PDF	ITD Website
Electronic Records Management Guidelines _ ITD.pdf	Current	Electronic Records Management Guidelines _ ITD		PDF	ITD Website
Enterprise Database Security _ ITD.pdf	Current	Enterprise Database Security _ ITD		PDF	ITD Website
Explanation of Security Standards _ ITD.pdf	Current	Explanation of Security Standards _ ITD		PDF	ITD Website
GIS Standards.pdf	Current	GIS Standards		PDF	ITD Website
Imaging Standard _ ITD.pdf	Current	Imaging Standard _ ITD		PDF	ITD Website
Information Technology Procurement _ ITD.pdf	Current	Information Technology Procurement _ ITD		PDF	ITD Website
Record Migration _ ITD.pdf	Current	Record Migration _ ITD		PDF	ITD Website
Server Operating Systems _ ITD.pdf	Current	Server Operating Systems _ ITD		PDF	ITD Website
Standards for Microfilming ND Public Records _ ITD.pdf	Current	Standards for Microfilming ND Public Records _ ITD		PDF	ITD Website
Standards for State of North Dakota Forms _ ITD.pdf	Current	Standards for State of North Dakota Forms _ ITD		PDF	ITD Website
executive-order-2011-20-memo.pdf	Current	executive-order-2011-20-memo			OMB Website

Resource	Relevant Dates	Description	Received From	Format	Transmitted
Dalrymple_ Additional Oversight of the Contracting and Implementation Proces.pdf	Current	Additional Oversight of the Contracting and Implementation Process			OMB Website
ckan - The open source data portal software.pdf	Current	Product being considered for GIS			Ckan.org Website
NDMeetingSummary04-27-2010.pdf	Current	North Dakota Partners Meeting Summary (describes development work on Legend)			MNHS Website
Propylon lrms_1page_datasheet_v1.pdf	Current	Propylon Legal and Regulatory Management System WP			Propylon Website
Propylon lwb_white_paper.pdf	Current	Propylon Legislative Workbench WP			Propylon Website
Voyager Search Solutions.pdf	Current	Product being considered for GIS - contact provided by Bob Nutsch	Jon Polay, Director of Sales		Voyagersearch.com Website
Welcome to Propylon, the market leader in legislative and regulatory content.pdf	Current	Propylon Home Page			Propylon Website
ND bill-tracking-user-manual	Feb-13	North Dakota Legislative Bill Tracking System User Manual			legis.nd.gov Website
ND 2013-15-Statewide IT Plan	Current	North Dakota Statewide Information Technology Plan 2013-2015			sits.ndus.edu Website
WyCAN Executive Steering Committee Contact Info	Current	Executive Committee Contact Heather Raschke hraschke@nd.gov			Secretary of State Website
WyCAN_Moderniazation_Operating_Model_Green2	9-Oct-13	Operations & Support Models for UI IT Modernization Projects: WyCAN Consortium			naswa.org Website
WyCAN RFI_Document__915164329	25-Jan-12	STATE OF COLORADO GOVERNOR'S OFFICE OF INFORMATION TECHNOLOGY REQUEST FOR INFORMATION #RFI-004-PVR-12 (WyCAN RFI)			bids.centerdigitalgov.com
WyCAN RFP_Document__134788938		State of Colorado Governor's Office of Information Technology WyCAN UI System Build and Maintenance RFP Number RFP-007-PVR-12			bids.centerdigitalgov.com

Resource	Relevant Dates	Description	Received From	Format	Transmitted
WyCAN Bid_Document__408394776	31-Jan-13	State of Colorado Governor's Office of Information Technology WYCAN UI System Independent Verification and Validation RFP-007-PVR-13			bids.centerdigitalgov.com
iGovern Unemployment Insurance _ Government Software Solutions, Governance -	Current	iGovern Unemployment Insurance _ Government Software Solutions, Governance - (WyCAN Provider)			hcltech.com
Insurance Dept_List of Information Systems_2013	Current		BLINGLE	Ms Word	Email
www.propylon.com/index.php/products/timearc	Current	TimeArc substrate used by Legend	Sean McGrath		Email
www.propylon.com/index.php/products/activearc	Current	Activearc substrate information	Sean McGrath		Email
http;//blog.law.cornell.edu/voxpop/2012/11/16/digital-law-what-lawyers-need-to-learn-from-accountants/	Current	Article about TimeArc approach	Sean McGrath		Email
Agencies asking to send e-records to Archives	Current		AJENKS		Email
PeopleSoft IT Admin - Responses Psft data	Current	Response to questions about archiving, purging, data integrity and replication	Bob Wohl		Email
north_dakota_gis_program_report July 1 2012 - June 30 2013	22-Nov-13	North Dakota GIS Program Report To Governor Jack Dalrymple		PDF	ITD Website
EA Principles for Document Management _ ITD	Current	EA Principles for Document Management _ ITD		HTML	ITD Website
EA Conceptual Principles _ ITD	Current	EA Conceptual Principles		HTML	ITD Website
4911CC - Organizational Status Report by Summary Account with Percentages (Month and Organizational Level Prompts)	Current	4911CC - Organizational Status Report by Summary Account with Percentages (Month and Organizational Level Prompts)	AJENKS	PDF	Email
ITD Budget Detail by Program	Current	ITD Budget Detail by Program		PDF	OMB Website
North Dakota Budget Primer	Current	North Dakota Budget Primer		PDF	ndepp.org
ContentsV2	Current	State Longitudinal Data System Contents of the SLDS		HTML	SLDS Website

Resource	Relevant Dates	Description	Received From	Format	Transmitted
DataRequestOutlineV2	Current	State Longitudinal Data System Data Request Outline		HTML	SLDS Website
GeneralDataGovernanceV2	Current	State Longitudinal Data System General Data Governance		HTML	SLDS Website
ldsstrategicroadmap	12-Jun-08	State of North Dakota Longitudinal Data System Strategic Roadmap		HTML	SLDS Website
UsageV2	Current	State Longitudinal Data System Connections and Data Usages		HTML	SLDS Website
NFES Forum Guide to Supporting Data Access for Researchers	Current	NFES Forum Guide to Supporting Data Access for Researchers		PDF	NCES.ED.GOV Website
Electronic records accessioned by State Archives - February 2014			AJENKS		Email

Appendix B: Digital Archives Study Interviews

Agencies participating in Digital Archives Study interviews:

- Department of Transportation
- Health – Vital Records
- Health – Environmental Health
- Governor's Office
- Industrial Commission – Mineral Resources – Oil & Gas
- Department of Trust Lands
- Legislative Council
- Secretary of State
- Water Commission
- Adjutant General - Emergency Services – Homeland Security
- Attorney General
- Department of Corrections & Rehabilitation
- Supreme Court and District Courts
- OMB – Human Resource Management System
- Department of Public Instruction
- Insurance Department
- Public Service Commission
- Job Service
- Department of Financial Institutions
- Department of Human Services
- State Library
- University of North Dakota
- State Historical Society

Information Technology Department staff who participated in Digital Archives Study interviews:

- Deputy CIO and Director of ITD
- Director of Administrative Services
- Director of Enterprise Systems
- Director of Computer Systems
- Disaster Recovery
- Enterprise Architecture Standards
- Enterprise EDMS Coordinator
- Business Intelligence Architect
- GIS Manager
- Enterprise IT Architects
- Security Administrator
- ConnectND State Program Manager
- State Records Management System Administrator

External Parties contacted by Tournesol Consultants:

- Sean McGrath, CTO – Propylon

Appendix C: Useful Terms and Definitions

Access. The OAIS entity that contains the services and functions which make the archival information holdings and related services visible to Consumers.

Authenticity: The degree to which a person (or system) regards an object as what it is purported to be. Authenticity is judged on the basis of evidence.

Born Digital. Refers to materials that originate in digital form.

Consumers. The role played by persons or client systems that interact with OAIS services to find preserved information of interest and to access that information in detail. This can include other digital archives and/or repositories, as well as internal OAIS persons or systems.

Archival Information Package (AIP). An Information Package, consisting of the content information and the associated Preservation Description Information (PDI), which is preserved within an ISO 14721 (OAIS) based digital repository.

Open Archival Information System (OAIS). An archive, consisting of an organization of people and systems that has accepted the responsibility to preserve information and make it available for a Designated Community. It meets a set of responsibilities, as defined in 3.1 of the ISO 14721:2012 standard that allows an OAIS archive to be distinguished from other uses of the term "archive". The term "Open" in OAIS is used to imply that this Recommendation and future related Recommendations and standards are developed in open forums, and it does not imply that access to the archive is unrestricted.

Dissemination Information Package (DIP). The Information Package, derived from one or more AIPs, received by the Consumer in response to a request to the ISO 14721 (OAIS) based digital repository.

Fixity Information. The information which documents the authentication mechanisms and provides authentication keys to ensure that the Content Information object has not been altered in an undocumented manner.

Information Package. The content information and associated Preservation Description Information which documents the preservation of the Content Information. The Information Package has associated Packaging Information used to delimit and identify the Content Information and Preservation Description Information.

Ingest. The OAIS entity that contains the services and functions that accept Submission Information Packages from Producers, prepares Archival Information Packages for storage, and ensures that Archival Information Packages and their supporting Descriptive Information become established within to the ISO 14721 (OAIS) based digital repository.

Long Term. A period of time long enough for there to be concern about the impact of changing technologies including support for new media and file formats, and a changing user community, on the information being held in the repository, which may extend into the indefinite future.

Producer. The role played by persons or client systems that provide the information to be preserved. This can include other OAISs or internal OAIS persons or systems.

Refreshment: A digital migration where the effect is to replace a media instance with a copy that is sufficiently exact that all Archival Storage hardware and software continues to run as before.

Repackaging: A digital migration in which there is an alteration in the Packaging Information of the AIP.

Replication: A digital migration where there is no change to the Packaging Information, the Content Information, and the PDI. The bits used to represent these Information Objects are preserved in the transfer to the same or new media instance.

Transformation: A digital migration in which there is an alteration to the Content Information or PDI of an Archival Information Package. For example, changing ASCII codes to UNICODE in a text document being preserved is a Transformation.

Submission Information Package (SIP): An Information Package that is delivered by the Producer to the OAIS for use in the construction of one or more AIPs.

Open Standard Technology Neutral File Format. A technology neutral file format is one that is designed to run on multiple platforms in a variety of software applications. It is an open file format in that the design of the specification involves collaboration in an open, public environment. Technology neutral open file formats can evolve as technology changes and thereby provide a backward compatibility to older versions. Examples of technology neutral file formats are XML and PDF/A.

Trustworthy Digital Repository. A trustworthy digital repository is one whose mission is to provide long-term access to managed digital resources; that accepts responsibility for the long term maintenance of digital resources on behalf of its depositors and for the benefit of current and future users; that designs its system(s) in accordance with commonly accepted conventions and standards to ensure the ongoing management, access, and security of materials deposited within it; that establishes methodologies for system evaluation that meet community expectations of trustworthiness; that can be depended upon to carry out its long-term responsibilities to depositors and users openly and explicitly; and whose policies, practices, and performance can be audited and measured.

Appendix D: FileNet Documents by Agency and Document Class

Table 10. FileNet Documents by Agency and Document Class (January 27, 2013)

Agency	Doc Class	Size (MB)	Document Count	Annotation Size (MB)	Annotation Count
Bank of ND	CustomerInbox	9.60	31,572	0.00	0
Total		**9.60**	**31,572**	**0.00**	**0**
Commerce	APUC	556.90	1,460	0.00	0
	CSED	6,962.10	9,677	0.01	9
	DevelopmentFund	1,079.72	4,785	0.00	4
	Energy	519.28	249	0.00	0
	OperationIntern	273.80	2,520	0.00	0
	PFHousing	2,576.61	5,776	0.00	1
Total		**11,968.42**	**24,467**	**0.01**	**14**
ConnectND	HigherEducation	806.90	1,419	0.00	0
	Operations	1.74	5	0.00	0
	ProjectManagement	194.83	308	0.00	0
	State	451.18	735	0.00	0
	Technical	687.08	5,004	0.00	0
Total		**2,141.72**	**7,471**	**0.00**	**0**
Corrections	FormPolicy	0.03	4	0.00	0
	HR	16,018.14	10,951	0.00	0
	Offender	0.00	2	0.00	0
	OffenderData	166,499.78	702,116	0.00	4
	OffenderDataFormData	0.03	25	0.00	0
	WebFormTemplate	0.07	1	0.00	0
Total		**182,518.05**	**713,099**	**0.00**	**4**
DFI	Compliance	110,454.90	29,496	0.00	3
	FormPolicy	0.01	3	0.00	0
	WebFormTemplate	0.09	3	0.00	0
Total		**110,455.00**	**29,502**	**0.00**	**3**
DHS	Adoption	23,744.95	93,407	0.00	0
	ChildSupportCaseFile	40,853.00	180,932	0.00	2
	ChildSupportRegionalCaseFile	269,885.08	368,946	0.01	44
	ChildSupportRemittals	212,638.48	2,184,944	0.12	173
	County	100,857.36	175,304	0.20	325
	DrugRebate	2,370.49	14,169	0.01	5
	EstateRecovery	1.66	194	0.00	0
	Fiscal	19,726.05	104,454	0.00	1
	Frame	33,616.05	24,881	0.00	0
	HumanResources	17,581.22	51,555	0.00	0
	MDS	12,455.24	147,083	0.00	0
	Mediclaim	419,333.19	4,509,208	2.41	322,771
	SNAP	1,191.73	11,073	0.00	6

Agency	Doc Class	Size (MB)	Document Count	Annotation Size (MB)	Annotation Count
	StateHospital	174,829.37	13,253	0.00	2
Total		**1,329,083.88**	**7,879,403**	**2.76**	**323,329**
DOH	EmergencyPreparedness	5,968.53	101,910	0.00	0
Total		**5,968.53**	**101,910**	**0.00**	**0**
DOT	CivilRights	25,248.06	12,761	0.08	718
	CLA	32.55	910	0.00	0
	Communications	42.68	595	0.00	0
	DLTS	162,054.59	9,395,006	2.36	237,588
	Engineering	326,043.78	289,765	0.37	1,626
	EngineeringFormData	0.71	81	0.00	0
	Finance	2,327.73	2,859	0.00	4
	FinanceFormData	0.74	102	0.00	0
	FormPolicy	16.48	346	0.00	0
	GeneralAdmin	28,330.87	92,354	0.26	1,362
	GeneralAdminFormData	2.12	750	0.00	0
	HumanResources	12,527.18	64,238	0.01	14
	HumanResourcesFormData	0.10	18	0.00	0
	IT	1,419.57	4,475	0.01	25
	Legal	793.40	2,056	0.00	0
	MotorCarrier	7,046.35	93,641	0.00	6
	MotorVehicle	839,945.50	6,666,478	1.95	124,806
	Safety	20,915.90	192,172	1.15	56,700
	StateFleet	2,916.99	7,256	0.02	31
	WebFormTemplate	23.27	171	0.00	0
Total		**1,429,688.54**	**16,826,034**	**6.22**	**422,880**
ESPB	TeacherLicensure	16,323.29	151,553	0.86	25,269
	WebFormTemplate	0.45	1	0.00	0
Total		**16,323.74**	**151,554**	**0.86**	**25,269**
Highway Patrol	ePermits	1,355.76	90,844	0.00	0
Total		**1,355.76**	**90,844**	**0.00**	**0**
Insurance	BoilerNH3	5,988.23	41,290	0.00	1
	CompanyLicensing	6,050.44	52,227	0.00	3
	FireTornadoClaims	11,391.43	15,751	0.01	12
Total		**23,430.10**	**109,268**	**0.02**	**16**
ITD	EDMS	118.39	1,579	0.00	1
	Email	0.07	3	0.00	0
	HumanResources	6,353.02	11,449	0.00	1
	NRC	1,785.17	1,286	0.00	0
	RecordsManagement	28.90	1,271	0.00	3
	Reports	6,873.81	113,945	0.00	0
	SYSMSG	8,859.57	451,336	0.00	0
	Training	2.49	6	0.00	0

Agency	Doc Class	Size (MB)	Document Count	Annotation Size (MB)	Annotation Count
Total		**24,021.42**	**580,875**	**0.00**	**5**
JSND	FormPolicy	2.44	320	0.00	0
	UI	88.98	29,005	0.00	0
	UnemploymentInsurance	301,940.97	5,518,858	13.16	746,117
	WebFormTemplate	364.58	266	0.00	0
Total		**302,396.96**	**5,548,449**	**13.16**	**746,117**
OMB	Email	0.02	1	0.00	0
	HRMS	8,674.51	11,949	0.06	99
	SPO_Vendor	7,737.00	66,523	0.02	20
Total		**16,411.53**	**78,473**	**0.08**	**119**
PERS	ContractsandAgreements	117.77	234	0.00	0
	DeferredComp	1,261.82	20,117	0.00	0
	Events	116.22	2,338	0.02	31
	FlexibleBenefits	33,628.57	181,844	0.49	1,404
	HumanResources	0.16	3	0.00	0
	Member	132,522.95	1,104,222	1.65	64,245
	Organization	2,949.39	12,641	0.20	530
	Reports	51,057.17	29,000	0.01	53
Total		**221,654.05**	**1,350,399**	**2.38**	**66,263**
RIO	Member	11,089.26	211,709	1.01	6,278
Total		**11,089.26**	**211,709**	**1.01**	**6,278**
SOS	CentralIndexing	98,466.60	705,400	0.12	69,281
	Publications	25.28	427	0.00	0
Total		**98,491.88**	**705,827**	**0.12**	**69,281**
State Land Dept	Minerals	3,005.80	16,104	0.00	0
	Surface	16,302.27	75,847	0.11	863
Total		**19,308.06**	**91,951**	**0.11**	**863**
TAX	AccountsReceivable	9,839.11	873,525	0.40	2,354
	Alcohol	416.75	9,078	0.04	101
	Business	192,471.82	215,320	0.75	36,183
	Corporate	108,642.90	78,836	0.09	314
	GeneralCorrespondence	2,366.36	38,037	0.19	642
	Income	1,217,720.07	3,956,257	2.86	1,273,070
	MotorFuels	1,704.01	38,723	0.12	460
	OilGas	111.55	5,597	0.02	86
	Sales	137,956.82	1,657,042	1.04	12,021
	Withholding	59,162.75	960,687	0.59	17,921
Total		**1,730,392.14**	**7,833,102**	**6.12**	**1,343,152**
VET	VeteransAffairs	1,772.47	9,958	0.00	1
Total		**1,772.47**	**9,958**	**0.00**	**1**
WSI	ClaimC1C2	78,372.52	708,220	0.77	111,348
	ClaimConvert	12,335.41	191,047	0.14	1,695

Agency	Doc Class	Size (MB)	Document Count	Annotation Size (MB)	Annotation Count
	ClaimDRO	4,904.50	5,912	0.01	26
	ClaimFax	23,446.34	402,626	1.37	226,937
	ClaimField	1,043.08	9,578	0.13	1,457
	ClaimFormsIn	107,249.63	1,488,384	1.53	224,768
	ClaimFormsOut	551,022.01	4,487,882	1.48	121,439
	ClaimFraud	9,205.98	32,676	0.08	309
	ClaimLegal	57,912.82	376,190	1.05	129,697
	ClaimLossPrev	16,649.73	6,906	0.11	3,683
	ClaimMedbill	64,008.93	728,805	0.49	14,141
	ClaimMedbillWNote	12.70	188	0.00	65
	ClaimMedNote	398,856.07	5,434,794	1.78	1,575,962
	ClaimNonMedbill	28,385.21	533,841	1.48	157,087
	ClaimRehab	21,908.11	210,118	0.83	27,293
	ClaimRelated	99,464.86	1,563,010	1.97	233,298
	PolicyConvert	49,538.21	387,992	0.02	47
	PolicyField	12.30	131	0.00	0
	PolicyFormsIn	43,620.40	267,772	0.02	76
	PolicyFormsOut	177,404.17	1,470,064	0.01	20
	PolicyFraud	1,443.91	2,698	0.00	0
	PolicyLegal	544.19	1,024	0.00	5
	PolicyLossControl	5,798.56	8,720	0.00	0
	PolicyRelated	3,285.01	44,532	0.02	29
Total		**1,756,424.65**	**18,363,110**	**13.31**	**2,829,382**
GrandTotal		**7,294,905.75**	**60,738,977**	**46.17**	**5,832,976**

Table 11. FileNet Documents by Agency and Document Class (February 27, 2014)

Agency	Doc Class	Size (MB)	Document Count	Annotation Size (MB)	Annotation Count
Bank of ND	CustomerInbox	8.65	37,937	0.00	0
Total		**8.65**	**37,937**	**0.00**	**0**
Commerce	APUC	661.97	1,585	0.00	0
	CSED	7,110.09	9,973	0.01	9
	DevelopmentFund	1,079.72	4,785	0.00	4
	Energy	519.28	249	0.00	0
	ESGNDHG	341.88	327	0.00	0
	OperationIntern	298.30	2,966	0.00	0
	PFHousing	3,264.49	7,331	0.00	1
Total		**13,275.73**	**27,216**	**0.01**	**14**
ConnectND	HigherEducation	806.90	1,419	0.00	0
	Operations	1.74	5	0.00	0
	ProjectManagement	194.83	308	0.00	0
	State	451.18	735	0.00	0
	Technical	687.08	5,004	0.00	0
Total		**2,141.72**	**7,471**	**0.00**	**0**
Corrections	ACAStandards	0.32	1	0.00	0
	FormPolicy	0.07	14	0.00	0
	HR	27,145.77	26,752	0.00	0
	HRFormData	0.01	13	0.00	0
	Offender	0.00	2	0.00	0
	OffenderData	187,395.97	848,350	0.00	4
	OffenderDataFormData	0.04	36	0.00	0
	OffenderFormData	0.24	436	0.00	0
	WebFormTemplate	0.23	6	0.00	0
Total		**214,542.65**	**875,610**	**0.00**	**4**
DFI	Compliance	155,649.86	34,102	0.00	3
	FormPolicy	0.01	3	0.00	0
	WebFormTemplate	0.09	3	0.00	0
Total		**155,649.96**	**34,108**	**0.00**	**3**
DHS	Adoption	25,324.35	103,416	0.00	0
	ChildSupportCaseFile	42,000.55	195,119	0.00	2
	ChildSupportFormData	0.04	23	0.00	0
	ChildSupportRegionalCaseFile	367,092.97	576,674	0.01	44
	ChildSupportRemittals	226,808.48	2,333,476	0.12	173
	Claims	0.14	2	0.00	0
	County	561,555.82	490,285	1.33	9,710
	DrugRebate	2,646.21	15,422	0.01	5
	EstateRecovery	1.66	194	0.00	0
	Fiscal	27,981.37	138,333	0.02	15

	FiscalGrants	24.50	106	0.00	0
	FiscalMedicaidRefunds	0.45	5	0.00	0
	FormPolicy	0.05	6	0.00	0
	Frame	49,227.82	39,873	0.00	0
	HCBS	1,406.53	11,236	0.63	15,400
	HumanResources	20,053.94	60,418	0.00	0
	LSTC	1,930.82	1,718	0.00	0
	MDS	16,575.65	196,247	0.00	0
	MedicaidExpansion	10,509.13	6,638	0.59	1,346
	Mediclaim	470,472.34	4,861,870	2.51	375,172
	Provider	1,366.02	14,085	0.00	0
	Reports	111.90	927	0.00	0
	SNAP	1,381.31	11,802	0.00	6
	StateHospital	216,366.34	15,733	0.00	2
	WebFormTemplate	0.11	2	0.00	0
Total		**2,042,838.50**	**9,073,610**	**5.23**	**401,875**
DOH	EmergencyPreparedness	5,968.53	101,910	0.00	0
Total		**5,968.53**	**101,910**	**0.00**	**0**
DOT	AuditServices	1.82	1	0.00	0
	CivilRights	26,283.07	12,646	0.08	718
	CLA	34.49	956	0.00	0
	Communications	42.68	595	0.00	0
	DLTS	176,360.93	10,470,227	2.33	233,929
	Engineering	418,965.51	335,872	0.37	1,843
	EngineeringFormData	2.49	286	0.00	0
	Finance	2,283.34	3,310	0.00	4
	FinanceFormData	0.48	64	0.00	0
	FormPolicy	17.14	323	0.00	0
	GeneralAdmin	46,647.81	137,065	0.57	6,269
	GeneralAdminFormData	1.82	250	0.00	0
	HumanResources	14,198.70	73,833	0.01	16
	HumanResourcesFormData	0.53	75	0.00	0
	IT	2,311.06	5,122	0.01	25
	Legal	988.77	2,767	0.00	0
	MotorCarrier	7,777.43	99,879	0.00	2
	MotorVehicle	889,700.96	6,172,125	2.16	152,503
	Safety	22,188.75	204,703	1.12	59,144
	StateFleet	3,445.63	7,791	0.02	31
	WebFormTemplate	23.30	162	0.00	0
Total		**1,611,276.70**	**17,528,052**	**6.66**	**454,484**
ESPB	TeacherLicensure	17,179.24	162,300	0.87	27,402
	WebFormTemplate	0.45	1	0.00	0
Total		**17,179.69**	**162,301**	**0.87**	**27,402**
Highway Patrol	ePermits	1,373.47	92,020	0.00	0

Total		**1,373.47**	**92,020**	**0.00**	**0**
Insurance	BoilerNH3	6,254.09	48,533	0.00	1
	CompanyLicensing	7,778.56	58,610	0.00	3
	FireTornadoClaims	16,203.71	18,392	0.01	12
Total		**30,236.37**	**125,535**	**0.02**	**16**
ITD	EDMS	145.87	1,845	0.00	1
	Email	0.07	3	0.00	0
	HumanResources	5,946.71	8,919	0.00	0
	NRC	1,747.34	1,260	0.00	0
	RecordsManagement	29.86	1,407	0.00	0
	Reports	6,964.32	111,181	0.00	0
	SYSMSG	9,542.37	530,659	0.00	0
	Training	3.98	7	0.00	0
Total		**24,380.52**	**655,281**	**0.00**	**1**
JSND	FormPolicy	2.44	322	0.00	0
	UI	93.69	30,319	0.00	0
	UnemploymentInsurance	337,389.31	6,167,258	14.88	829,074
	WebFormTemplate	367.91	268	0.00	0
Total		**337,853.35**	**6,198,167**	**14.88**	**829,074**
OMB	Email	0.02	1	0.00	0
	HRMS	9,147.17	13,178	0.08	163
	SPO_Vendor	8,882.33	72,745	0.02	20
Total		**18,029.52**	**85,924**	**0.10**	**183**
PERS	ContractsandAgreements	128.76	252	0.00	0
	DeferredComp	1,261.82	20,117	0.00	0
	Events	135.69	2,999	0.02	31
	FlexibleBenefits	26,387.40	141,340	0.47	1,362
	HumanResources	0.16	3	0.00	0
	Member	145,525.51	1,273,880	1.84	82,366
	Organization	3,171.66	15,142	0.24	713
	Reports	51,057.17	29,000	0.01	53
Total		**227,668.17**	**1,482,733**	**2.59**	**84,525**
RIO	Member	12,185.75	226,725	1.08	7,303
Total		**12,185.75**	**226,725**	**1.08**	**7,303**
SOS	CentralIndexing	120,335.25	760,907	0.11	76,900
	Publications	31.29	478	0.00	0
Total		**120,366.54**	**761,385**	**0.11**	**76,900**
State Land Dept	Minerals	4,403.38	18,835	0.00	0
	Surface	17,951.60	79,335	0.16	1,114
Total		**22,354.98**	**98,170**	**0.16**	**1,114**
TAX	AccountsReceivable	12,575.38	1,138,132	0.43	2,926
	Alcohol	613.62	10,228	0.05	130
	Business	228,743.68	247,220	0.77	39,079
	Corporate	128,518.44	88,295	0.16	2,640

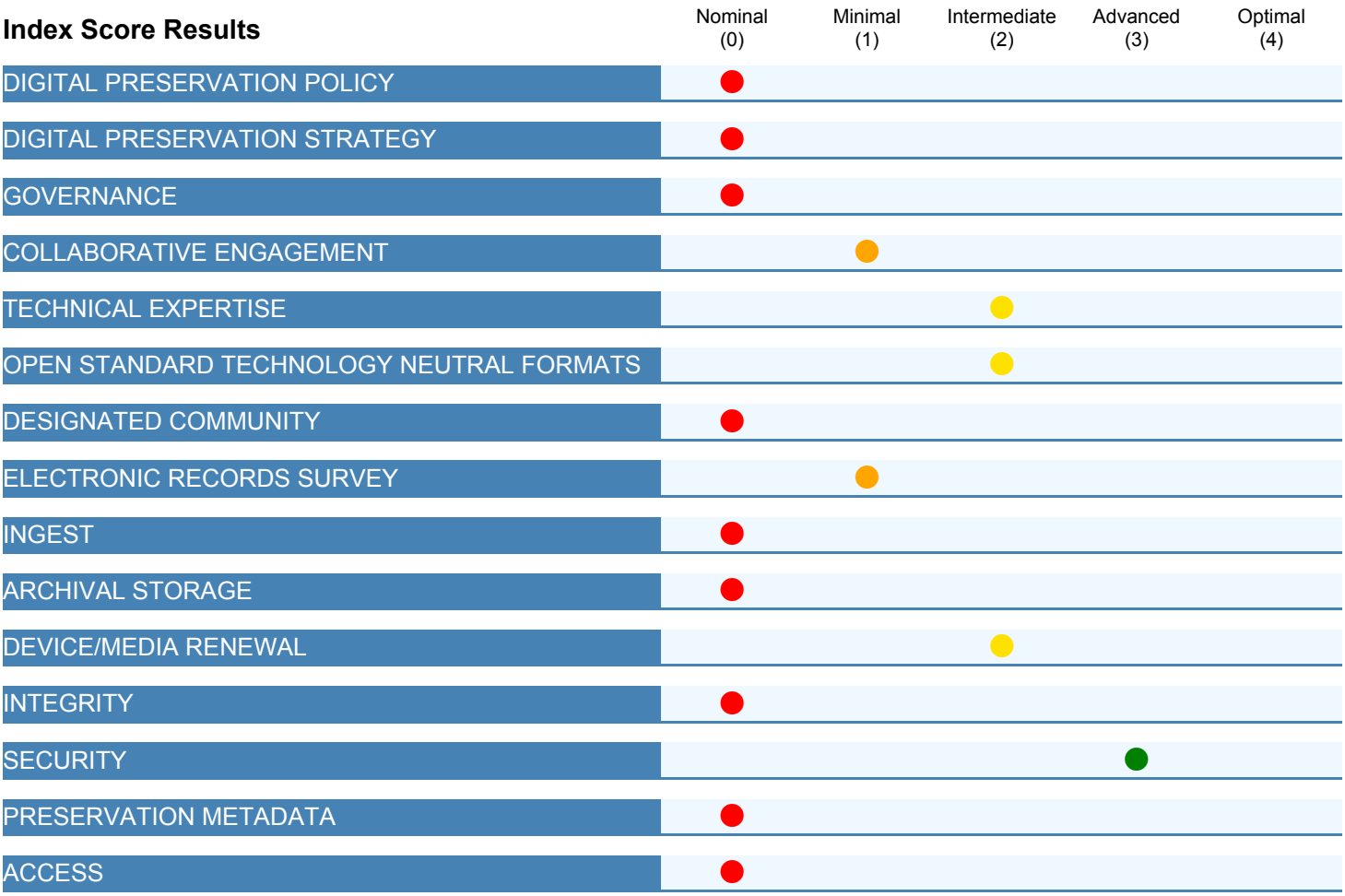
	GeneralCorrespondence	3,252.09	52,979	0.20	702
	Income	1,263,921.66	4,098,757	2.87	1,323,736
	MotorFuels	1,794.13	39,469	0.13	492
	OilGas	111.60	5,600	0.02	86
	Sales	146,248.85	1,760,920	1.05	13,070
	Withholding	65,065.08	1,050,568	0.60	19,590
Total		**1,850,844.54**	**8,492,168**	**6.28**	**1,402,451**
VET	VeteransAffairs	45,912.07	123,254	0.00	1
Total		**45,912.07**	**123,254**	**0.00**	**1**
WSI	ClaimC1C2	96,323.77	765,790	0.80	121,441
	ClaimConvert	12,397.01	191,936	0.14	1,695
	ClaimDRO	5,216.14	6,520	0.01	42
	ClaimFax	23,446.08	402,623	1.37	227,073
	ClaimField	1,235.67	10,719	0.14	1,540
	ClaimFormsIn	169,557.72	1,633,221	1.64	272,196
	ClaimFormsOut	576,173.59	4,752,517	1.51	132,150
	ClaimFraud	9,421.17	33,367	0.09	363
	ClaimLegal	61,486.50	395,893	1.08	137,486
	ClaimLossPrev	16,670.90	6,924	0.11	3,709
	ClaimMedbill	87,561.39	966,424	0.55	21,378
	ClaimMedbillWNote	12.70	188	0.00	65
	ClaimMedNote	443,241.03	5,956,803	1.82	1,685,224
	ClaimNonMedbill	29,727.92	561,222	1.51	175,326
	ClaimRehab	25,378.40	231,121	0.84	28,971
	ClaimRelated	108,325.06	1,673,690	2.01	250,413
	FinanceContract	71.24	422	0.00	0
	PolicyConvert	49,538.21	387,992	0.02	47
	PolicyField	15.15	181	0.00	0
	PolicyFormsIn	54,381.98	313,659	1.07	14,821
	PolicyFormsOut	209,222.53	1,734,280	0.06	93
	PolicyFraud	1,861.15	3,257	0.00	0
	PolicyLegal	786.95	1,630	0.00	5
	PolicyLossControl	6,397.38	9,409	0.00	1
	PolicyPremiumAudit	47,295.54	6,940	0.01	8
	PolicyRelated	4,429.14	62,913	0.02	35
Total		**2,040,174.33**	**20,109,641**	**14.82**	**3,074,082**
GrandTotal		**8,794,261.71**	**66,299,218**	**52.81**	**6,359,432**

Appendix E: Digital Preservation Capability Self-Assessment completed March 2014

Digital Preservation Capability Self-Assessment

Name:	Lori Ashley
Title:	Consultant
Agency:	NA
State:	ND
Reports To:	Governor
Contributors:	Becky Lingle, Charles Dollar, Ann Jenks, Lori Ashley
	Repository - State Historical Society - Archives

Index Score Results



Index Score: 11/60

Based upon your responses, the digital preservation capabilities and services of your archive/records management unit falls into the **1 Stage (Minimal)**. Digital preservation capabilities are rudimentary and most electronic records that merit long-term retention are at risk.

This scorecard indicates the current capabilities of the Archives/RM unit for each component in the Digital Preservation Capability Maturity Model. The filled in circles (red, orange, yellow, light green, dark green) denote where all of the respective requirements have been met.

1. DIGITAL PRESERVATION POLICY

The government unit charged with ensuring preservation and access to permanent legal, fiscal, operational, and historical electronic records should issue its digital preservation policy in writing including the purpose, scope, accountability, and approach to the operational management and sustainability of trustworthy digital repositories.

- ☑ The Archives/RM unit does not have a written digital preservation policy.
- ☐ The Archives/RM unit has a digital preservation policy in development but it has not yet been approved or issued.
- ☐ The Archives/RM unit has issued a digital preservation policy and it is widely disseminated to stakeholders.
- ☐ The Archives/RM unit periodically conducts a self-assessment and reports its adherence to its digital preservation policy.
- ☐ The Archives/RM unit reviews and updates the digital preservation policy at least every two years.

2. DIGITAL PRESERVATION STRATEGY

The organization charged with the preservation of permanent electronic government records must proactively address the risks associated with technology obsolescence including plans related to periodic renewal of storage devices, storage media, and adoption of preferred preservation file formats.

- ☑ The Archives/RM unit does not have a plan to address technology obsolescence.
- ☐ The Archives/RM unit accepts electronic records in their native format on an ad hoc basis with the expectation that new software will become available to support these formats.
- ☐ The Archives/RM unit encourages records producers to retain records of long-term value in preservation-ready file formats.
- ☐ The Archives/RM unit proactively and systematically monitors changes in technologies that may impact the digital records collections and the archival repository.
- ☐ The Archives/RM unit implements the transformation of selected native file formats to preferred/supported preservation file formats in the archival repository.
- ☐ The Archives/RM unit implements transformation of all electronic records from records producing units to preferred preservation file formats in the archival repository.

3. GOVERNANCE

The state or territory has a formal decision-making framework that assigns accountability and authority for the preservation of electronic records with permanent historical, fiscal, operational or legal value, and articulates approaches and practices for trustworthy digital repositories sufficient to meet stakeholder needs. Governance is exercised in conjunction with information management and technology functions and with other custodians and digital preservation stakeholders such as records producing units and records consumers and enables compliance with applicable laws, regulations, record retention schedules, and disposition authorities.

- ☑ The state/territory does not specifically address digital preservation requirements in the scope of current governance activities.
- ☐ A project- based digital preservation governance framework is operational or has been successfully completed.
- ☐ The operational state/territory-wide digital preservation governance framework identifies the various roles of stakeholders in the preservation of electronic records.
- ☐ An operational state/territory-wide digital preservation governance framework is in place that assigns accountability and authority for the preservation of electronic records.
- ☐ The state/territory digital preservation governance framework specifies an on-going commitment to the sustainability of an ISO 14721 conforming archival repository.
- ☐ The operational state/territory-wide digital preservation governance framework for digital preservation is reviewed and updated at least every two years to take into account changing technologies and new organizational structures.

4. COLLABORATIVE ENGAGEMENT

Digital preservation is a shared responsibility so the organization with a mandate to preserve electronic government records in accordance with accepted digital preservation standards and best practices is well served by maintaining and promoting collaboration among its internal and external stakeholders. Interdependencies between and among the operations of records producing units of government, legal and statutory requirements, information technology policies and governance, and historical accountability should be systematically addressed.

- ☐ No collaborative digital preservation environment exists in the state/territory.
- ☑ The Archives/RM unit is working to establish a framework for collaborative engagement on digital preservation issues in the state/territory.
- ☐ Under a collaborative digital preservation framework the Archives/RM unit has successfully engaged or currently engaged in identifying specific digital preservation requirements for selected records producing units.
- ☐ Under its collaborative digital preservation framework the Archives/RM unit has successfully engaged or is currently engaged in one or more collaborative digital preservation projects with external stakeholders.
- ☐ Under its collaborative digital preservation framework the Archives/RM unit has successfully engaged in or is currently engaged in identifying the specific digital preservation requirements of most records producing units.
- ☐ The Archives/RM unit continuously monitors and updates the collaborative framework of digital preservation requirements of all records producing units.

5. TECHNICAL EXPERTISE

A critical component in a sustainable digital preservation program is access to professional technical expertise that can proactively address business requirements as well as respond to impacts of evolving technologies. The technical infrastructure and key processes of an ISO 14721 conforming archival repository requires professional expertise in archival storage, digital preservation solutions, and lifecycle electronic records management processes and controls. This technical expertise may exist within the Archives/Records Management unit, be provided by a centralized function or service bureau, or by external service providers and should include an in-depth understanding of critical digital preservation actions and their associated recommended practices.

- ☐ The Archives/RM unit has little or no operational access to specialized professional technical expertise in digital preservation or electronic records management.
- ☑ The Archives/RM unit has operational access to technical expertise (internal or external) that only supports project-based digital preservation initiatives.
- ☑ The Archival/RM unit has operational access to technical expertise (internal or external) in DoD 5015.2 compliant electronic records management software.
- ☐ The Archival/RM unit has operational access to technical expertise (internal or external) that only supports non-conforming ISO 14721 Submission Information Packages (SIP) and Archival Information Packages (AIP).
- ☐ The Archival/RM unit has operational access to technical expertise (internal or external) that supports ISO14721 conforming Submission Information Packages (SIP) and Archival Information Packages (AIP).
- ☐ The Archival/RM unit has operational access to technical expertise that supports all functions of an ISO 14721 conforming archival repository, including long-term digital preservation planning.

6. OPEN STANDARD TECHNOLOGY NEUTRAL FORMATS

A fundamental requisite for a sustainable digital preservation program that ensures long-term access to usable and understandable electronic records is mitigation of obsolescence of file formats. Open standard technology neutral ("OS/TN") file formats are developed in an open, public setting, issued by a certified standards organization, and have few or no technology dependencies. Current preferred OS/TN format examples include:HTML, Plain Text, XML, ODF, and PDF/A for text; CSV for spreadsheets; JPEG 2000 for photographs; PDF/A, PNG, and TIFF for scanned images; SVG for vector graphics; BWF for audio; MPEG-4 and Motion JPEG2000 for video; WARC for web pages. Over time new digital preservation tools and solutions will emerge that will require new OS/TN file formats. OS/TN formats are backwardly compatible so they can support interoperability across technology platforms over an extended period of time.

- ☐ The Archives/RM unit has not adopted any OS/TN file format as a digital preservation format.
- ☑ The Archives/RM unit has adopted at least one OS/TN file format as digital preservation format.
- ☑ The Archives/RM unit has adopted at least three OS/TN file formats as digital preservation formats.
- ☐ The Archives/RM unit has adopted OS/TN for text.
- ☐ The Archives/RM unit has adopted an OS/TN for spreadsheets.
- ☐ The Archives/RM unit has adopted an OS/TN for raster bit map images (scanned and born digital).
- ☐ The Archives/RM unit has adopted an OS/TN for vector graphics.
- ☑ The Archives/RM unit has adopted an OS/TN for audio.
- ☑ The Archives/RM unit has adopted an OS/TN for videos.
- ☐ The Archives/RM unit has adopted an OS/TN for web pages.
- ☐ The Archives/RM unit continuously monitors the sustainability of OS/TN file formats and adopts them as appropriate for use as preservation formats.

7. DESIGNATED COMMUNITY

The organization that has responsibility for preservation and access to permanent legal, operational, fiscal or historical government records is well served through proactive outreach and engagement with its Designated Community. The Archives/Records Management unit has written procedures and formal agreements with records producing units that document the content, rights, and conditions under which the digital archival repository will ingest, preserve, and provide access to electronic records. The Archives/Records Management unit maintains written procedures regarding ingest of electronic records and access to its digital collections. Records Producers will submit fully conforming ISO 14721 Submission Information Packages (SIPs) while Dissemination Information Packages (DIPs) are developed and updated in conjunction with its user communities.

- [x] There is no written documentation that defines the rights, obligations, and responsibilities of record producing units or designated communities for electronic records held by the archival repository.
- [ ] The Archives/RM unit has informal, ad hoc agreements with selected records producing units that support the transfer of electronic records to the archival repository.
- [ ] The Archives/RM unit periodically analyzes access and use statistics for its archival repositories to identify and address user needs and requirements.
- [ ] The Archives/RM unit has established formal, written agreements that support the transfer of electronic records from selected record producing units.
- [ ] The Archives/RM unit proactively reaches out to selected designated communities to identify their needs and requirements for access to electronic records in the archival repository.
- [ ] The Archives/RM unit works with most records producing units in the state/territory to establish formal written agreements about their rights, obligations, and responsibilities for transferring electronic records to the archival repository.
- [ ] The Archives/RM unit works closely with most designated communities to establish appropriate access priorities that meet their needs and requirements.
- [ ] The Archives/RM unit actively engages with all state/territory records producing units to establish formal written agreements about their rights, obligations and responsibilities for transferring electronic records to the archival repository.
- [ ] The Archives/RM unit works closely with all designated communities to establish appropriate access priorities that meet their needs and requirements.

8. ELECTRONIC RECORDS SURVEY

A trustworthy digital repository cannot fully execute its mission or engage in realistic digital preservation planning without a projected volume and scope of electronic records that will come into its custody. It is likely that some information already exists in approved retention schedules but may require further elaboration as well as periodic updates, especially with regard to preservation ready, near preservation ready, and legacy electronic records held by records producing units.

- ☐ The Archives/RM unit has little or no capability or resources to collect and analyze information about the volume, location, media, format types, and life cycle management requirements for electronic records.
- ☑ The Archives/RM unit relies on existing retention schedules to identify electronic records of permanent historical, fiscal, and legal value in the custody of records producing units.
- ☑ The Archives/RM unit conducts ad hoc, one-time interviews or surveys to identify electronic records of permanent historical, fiscal, and legal value in the custody of selected records producing units.
- ☐ The Archives/RM unit conducts systematic interviews, surveys, and retrospective analysis of existing retention schedules to identify electronic records of permanent historical, fiscal, and legal value in the custody of selected records producing units.
- ☐ The Archives/RM unit periodically analyzes existing retention schedules to identify “at risk” electronic records of permanent historical, fiscal, operational, and legal value in the custody of selected records producing units.
- ☐ The Archives/RM unit supplements retention schedule analysis through collection of information about the volume and location (e.g., shared drives) of “at risk” electronic records of permanent historical, fiscal, operational, and legal value in the custody of records producing units.
- ☐ The Archives/RM unit supplements retention schedule analysis through collection of information about the media and format types of “at risk” electronic records of permanent historical, fiscal, operational, and legal value in the custody of records producing units.
- ☐ The Archives/RM unit has identified preservation-ready and non preservation-ready permanent electronic records in the custody of all of records producing units.
- ☐ The Archives/RM unit uses information (e.g., date eligible for transfer) about electronic records in the custody of all records producing units as an inventory to systematically manage the transfer and ingest of their electronic records.

9. INGEST

A digital archival repository that complies with ISO 14721 has the capability to systematically Ingest(receive and accept) electronic records from records producing units in the form of Submission Information Packages (SIPs), move them to a staging area where virus checks and content and format validations are performed, transform electronic records into designated preservation formats as appropriate, extract metadata from SIPs and write it to Preservation Description Information (PDI), creates Archival Information Packages (AIPs), and transfer the AIPs to the repository’s storage function. This process is considered the minimal workflow for transferring records into a digital archival repository for long-term preservation and access.

- ☑ The Archives/RM unit does not currently accession or ingest electronic records.
- ☐ The Archives/RM unit ingests any available electronic records from records producing units in any format, but assumes only the responsibility to keep the bit stream alive.
- ☐ The archival repository ingests partially conforming ISO 14721 SIPs.
- ☐ Partially conforming ISO 14721 SIPs are ingested and held in a staging area while virus checks and format validations are manually executed.
- ☐ Partially conforming ISO 14721 AIPs are manually transferred from a staging area to archival storage.
- ☐ Fully conforming ISO 14721 SIPs are ingested and checked for virus and format validations with semi-automated tools.
- ☐ Fully conforming ISO 14721 AIPs are produced and transferred to archival storage through semi-automated tools.
- ☐ Fully conforming ISO 14721 SIPs are ingested and automatically checked for virus and format validations.
- ☐ Fully conforming ISO 14721 AIPs are automatically produced and transferred to archival storage.

10. ARCHIVAL STORAGE

ISO 14721 delineates systematic automated storage services that support receipt and validation of successful transfer of Archival Information Packages (AIPs) from ingest, creation of Preservation Description Information (PDI) for each AIP that confirms its "fixity" during any preservation actions through the capture and maintenance of error logs, updates to PDI, including transformation of electronic records to new formats, production of Dissemination Information Packages (DIPs) for Access, and collection of operational statistics.

- ☑ The Archives/RM unit only has access to primitive non-conforming archival storage (e.g., CDs/DVDs).
- ☐ One storage tier level is used in the archival repository for partially conforming ISO14721 AIPs.
- ☐ A single instance of an archival storage repository is used for the storage of partially conforming ISO 14721 AIPs.
- ☐ Two or more storage tier levels are used to store partially conforming ISO 14721 AIPs.
- ☐ Two geographically separated instances of an archival storage repository are used for the storage of partially conforming ISO 14721 AIPs.
- ☐ Manual capture of partially conforming Preservation Description Information (PDI) establishes the provenance of partially conforming ISO 14721 AIPs.
- ☐ Manual capture of selected partially conforming Archival Storage operational statistics to support ad hoc digital preservation planning.
- ☐ Two or more storage tier levels are used to store conforming ISO 14721 AIPs.
- ☐ Two geographically separated instances of an archival storage repository are used for the storage of conforming ISO 14721 AIPs.
- ☐ Conforming ISO 14721 Preservation Description Information (PDI) that establishes the provenance of compliant AIPs (e.g., format transformations, device/media renewal, integrity checks, and access/rights protection) is captured with semi-automated tools.
- ☐ Semi-automated capture of conforming ISO 14721 archival storage operational statistics that support systematic digital preservation planning.
- ☐ Automated capture of Preservation Description Information (PDI) establishes the provenance of conforming ISO 14721 AIPs.
- ☐ Automated capture of conforming archival storage operational statistics supports on- going comprehensive digital preservation planning.
- ☐ Three geographically separated instances of an archival storage repository are used for the storage of conforming ISO 14721 AIPs.

11. DEVICE/MEDIA RENEWAL

No known digital device or storage medium is invulnerable to decay and obsolescence. A foundational digital preservation capability is ensuring the readability of the bitstreams underlying the electronic records. ISO 14721 specifies that a trustworthy digital repository's storage devices and storage media should be monitored and renewed (" refreshed") periodically to ensure that the bit streams remain readable over time. A projected life expectancy of removable storage media does not necessarily apply in a specific instance of storage media. Hence, it is important that a trustworthy digital repository have a protocol for continuously monitoring removable storage media (e.g., magnetic tape, external tape drive, or other media) to identify any that face imminent catastrophic loss. Ideally, this renewal protocol would automatically execute renewal after review by the digital archival repository.

- ☐ The Archives/RM unit has no device/media renewal protocol in place.
- ☐ Current practice mandates archival repository device/media renewal when they are on the verge of becoming obsolescent.
- ☑ Current practice mandates archival repository device/media renewal on a regularly scheduled basis (e.g., every ten years).
- ☐ An annual device/media inspection program identifies archival repository device/storage media that face imminent catastrophic data loss.
- ☐ The archival repository’s device and media renewal program continuously monitors the potential loss of the readability of electronic records and automatically replaces devices/storage media and writes the records to new storage media.

12. INTEGRITY

A key capability in ISO 14721 conforming digital repositories is ensuring the integrity of the records in its custody, which involves two related preservation actions. The first action generates a cryptographic hash algorithm which takes any digital object regardless of size or content type and normalizes it to a fixed length bit stream (e.g., 128 bits). This fixed length bit stream is called a hash digest and it serves as a digital fingerprint of a larger digital object. The second action involves integrity fixity that supports an unbroken electronic chain of custody captured in Preservation Description Information (PDI) in AIPs.

- ☑ The archival repository has no documented procedure for integrity protection of electronic records in its custody.
- ☐ The archival repository generates and preserves MD-5 hash digests before and after device/media renewal and other archival storage preservation actions.
- ☐ The archival repository generates and preserves SHA-1 hash digests before and after device/media renewal and other internal preservation actions for partially conforming ISO 14721 AIPs.
- ☐ The archival repository generates SHA-2 hash digests before and after device/media renewal and other internal preservation actions for all fully conforming ISO 14721 AIPs and stores them in the Preservation Description Information (PDI) of the AIPs.
- ☐ The archival repository encapsulates fully conforming ISO 14721 AIPs in XML and signs them with a digital signature.
- ☐ Integrity protection procedures are continuously evaluated and updated as new tools and approaches become available.

13. SECURITY

Contemporary enterprise-wide information systems typically execute a number of shared or common services that may include inter-process communication, name services, temporary storage allocation, exception handling, role based access rights, security, backup and business continuity, and directory services, among others. An ISO 14721 conforming archival repository is likely to be part of an information system that may routinely provide some or perhaps all of the core security, backup, and business continuity services including firewalls, role based access rights, data transfer integrity validations, logs for all preservation activities, including failures and anomalies to demonstrate an unbroken chain of custody.

- ☐ Currently, the archival repository does not have formal disaster recovery, backups, or firewall procedures in place to protect the security of electronic records.
- ☑ The security of electronic records in the archival digital repository is protected through disaster recovery procedures.
- ☑ The security of electronic records in the archival digital repository is protected through comprehensive firewall protection.
- ☑ The security of electronic records in the archival digital repository is protected through comprehensive role based access rights management.
- ☐ The archival repository continuously monitors security protection processes and revises them in response to evolving technology capabilities and changing business requirements

14. PRESERVATION METADATA

A digital archival repository collects and maintains metadata that describes actions associated with custody of permanent records including an audit trail that documents preservation actions carried out, why and when they were performed, how they were carried out and with what results. A current best practice is the use of a PREMIS-based Data Dictionary to support an electronic chain of custody that documents authenticity over time as preservation actions are executed. Capture of all related metadata, transfer of the metadata to any new formats/systems, and secure storage of metadata are critical. All metadata is stored in the Preservation Description Information (PDI) component of conforming AIPs.

- ☑ Little or no preservation metadata is created, captured or maintained for electronic records.
- ☐ Minimal preservation metadata is available to support electronic records in the archival repository.
- ☐ A partially conforming ISO 14721 preservation metadata scheme (like Dublin Core) is in place for electronic records in the archival repository.
- ☐ A preservation metadata schema is in place that includes a data dictionary that identifies ISO 14721 conforming comprehensive preservation metadata specifications.
- ☐ A PREMIS-based preservation metadata schema is in place that is continuously reviewed and updated to take into account new and different types electronic records that are transferred to an archival repository.

15. ACCESS

Organizations with a mandate to support public access to permanent government records are subject to authorized restrictions. An ISO 14721 conforming archival repository will provide consumers with trustworthy records in “disclosure free” Dissemination Information Packages (DIPs) redacted to protect, privacy, confidentiality, and other rights where appropriate, and searchable metadata that users can query to identify and retrieve records of interest to them. Production of DIPs is tracked, especially when they involve extractions, to verify their trustworthiness and to identify query trends that are used to update electronic accessibility tools to support these trends.

- ☑ The archival repository has no capability to support access to electronic records in its custody.
- ☐ The archival repository provides copies of partially conforming ISO 14721 DIPs in at least one (1) format (e.g., digital photographs in JPEG 2000).
- ☐ The archival repository supports access only to partially conforming ISO 14721 DIPs in two (2) open standard technology neutral (OS/TN) formats (e.g., PDF/A, JPEG 2000, or TIFF).
- ☐ The ISO 14721 conforming archival repository produces DIPs in at least six (6) open standard technology neutral (OS/TN) formats.
- ☐ The conforming ISO 14721 archival repository analyzes user query trends to identify the need for updated accessibility tools.
- ☐ The conforming ISO 14721 archival repository disseminates DIPs containing records in any format that users request.
- ☐ The conforming ISO 14721 archival repository enables redaction of electronic records with access restrictions in its custody where appropriate.