



Achieving a Step Change in Digital Preservation Capability

An assessment of Preservica using the Digital Preservation Capability Maturity Model (DPCMM)©

Executive Summary

Nearly every organization – from archives and libraries to government agencies and businesses - face the challenge of how to properly manage and safeguard their rapidly growing volume and diversity of digital content, collections and records. It is also widely recognized that this digital content is fragile – susceptible to bit corruption, media degradation, technology obsolescence, Information Technology (IT) refresh cycles as well as file format and software program obsolescence.

Ensuring important content and records can be found, understood and more importantly read over the long-term (>10 years) requires a robust strategy and approach to digital preservation – covering policy, governance, processes and systems.

Over the last few years a number of tools and frameworks have emerged for assessing an organization's ability to ensure the continuity of electronic content over successive generations of people, business processes and technologies. One such tool, the Digital Preservation Capability Maturity Model (DPCMM)¹ is especially useful because it combines the requirements of the OAIS (Open Archival Information System) Reference model (ISO 14721)² with the requirements for a Trustworthy Digital Repository (ISO 16363)³ – to create an assessment across 15 different components (or key performance areas) – from archival storage to digital preservation policy.

The DPCMM framework can be used to quickly benchmark an organization's preservation capability – helping to identify strengths and gaps against a range of performance levels – from Nominal to Optimal - for each component.

This paper provides an overview of the DPCMM, but in particular assesses the impact that deploying a standards-based digital preservation system, like Preservica, can have on an organization's overall capability to preserve, manage and provide access to valued digital information assets over the long term.

Indeed, the findings of this assessment⁴ show that by deploying Preservica, an organization can achieve a significant step-change in their digital preservation capability, moving from nominal/ evolving to advanced/optimal capability levels in 9 out of the 15 DPCMM components. In addition, Preservica's automated workflows across all the OAIS functions can be used to establish the basis of an organization's internal digital preservation processes. This allows for greater focus and resources to be placed on the remaining capabilities which are primarily concerned with digital preservation policy, collaborative engagement with stakeholders and governance.

Of course, deploying any digital preservation system will have an impact on the DPCMM score, however, the level of impact will greatly depend on the how completely the digital preservation system conforms to the Trustworthy Digital Repository (TDR) and OAIS standards.

Finally, when selecting a digital preservation system, compliance with standards is just one of the aspects an organization should consider, in addition organizations should also look for ease of use, comprehensive customer support and maintenance, simple comprehensive Service Level Agreements (SLAs), and a scalable and proven platform that integrates with the organization's unique and diverse information architecture and infrastructure.

Preservica is one such system that meets all of these requirements.

1 Digital Preservation Capability Maturity Model Background and Performance Metrics, Version 2.6, at: <http://www.securelyrooted.com/dpcmm>

2 ISO 14721 Open Archival Information System (OAIS) Reference Model http://www.iso.org/iso/catalogue_detail.htm?csnumber=57284

3 ISO 16363 Audit and Certification of a Trustworthy Digital Repository http://www.iso.org/iso/catalogue_detail.htm?csnumber=56510

4 Charles Dollar and Lori Ashley, creators of the DPCMM, confirmed that Preservica's selection of statements that resulted in the self-assessment scorecard are within the parameters of DPCMM performance metrics.

Contents

What is the Digital Preservation Capability Maturity Model?	4
What is a Digital Preservation System?	6
The Overall Impact of Deploying a Standards-based Digital Preservation System	8
Where a Standards-Based Digital Preservation System Makes a Significant Impact	9
Where Organizational Processes are Essential	11
Achieving a Higher DPCMM Rating	12
Conclusions	13
Useful Resources	14
About Preservica	15

What is the Digital Preservation Capability Maturity Model?

The idea of a capability maturity model (CMM) was developed by the Software Engineering Institute of Carnegie Mellon University and used in commercial software engineering in the 1990s. Essentially CMM is a tool that helps organizations measure the maturity of their software development process. CMM puts a simple scoring scheme to a relatively complex topic and provides a clear set of steps to achieve improved and sustainable performance over time.

The **Digital Preservation Capability Maturity Model (DPCMM)** was developed around the same principles and is focused on the processes and systems needed to keep valuable digital assets accessible and readable for the long term (typically > 10 years).

The DPCMM white paper¹ describes a range of defined components that enable organizations to measure the maturity of their digital preservation processes and supporting technical environments, and ultimately judge how safe their digital assets really are. Most importantly the DPCMM sets out a clear path to help organizations improve.

Brief descriptions of the 15 defined components in the DPCMM are:

DPCMM Component	Capability Description
Digital Preservation Policy	Statements that commit the organization to preserve specific digital records in accordance with standards and good operational practices for as long as may be required.
Digital Preservation Strategy	Stipulates how digital records will be acquired, protected from file format and storage technology obsolescence, and made available to users.
Governance	Defined roles and assigned responsibility and authority for preservation activities.
Collaboration	Engagement of internal and external stakeholders in the implementation of digital preservation policy and strategy.
Technical Expertise	Access to internal or third party digital preservation technical expertise.
Open Standard Technology Neutral Formats	Adoption of sustainable file formats and monitoring of emerging technologies.
Designated Community	Working with record producers to ensure acquisition of records and engaging with user communities to enable efficient and effective access.
Electronic Records Survey	Identification of records of long-term and permanent value and proactive engagement with records producers.
Ingest	Packaging and validating content and descriptive metadata before transferring to storage.
Archival Storage	Safe, reliable, durable storage.
Device/Media Renewal	Periodic renewal of physical storage and devices to address media obsolescence.
Integrity	Actively ensuring the integrity of stored records.
Security	Operational procedures and protocols for preservation infrastructure and services.
Preservation Metadata	Providing an auditable chain of custody.
Access	Capability to support access to digital records stored in the repository.

Organizations can use the DPCMM components and metrics to rate their current capability against five (5) performance levels and to determine what is “good enough” to meet their needs:

Stage 1: (Nominal) a systematic digital preservation program has not been undertaken and most, if not all, electronic records that merit long-term retention are at risk.

Stage 2: (Minimal) digital preservation capabilities are rudimentary and do not rise to the level of ISO 14721/ISO 16363 specifications. Consequently, most electronic records that merit long-term retention are at risk.

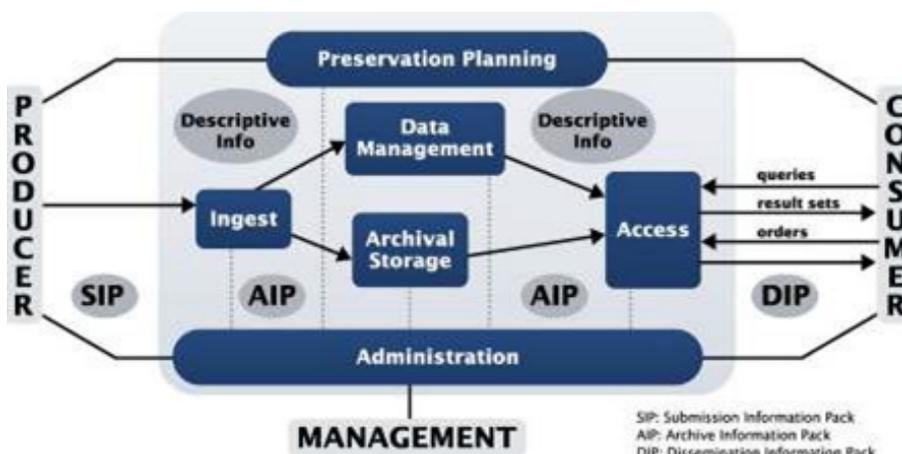
Stage 3: (Intermediate) the organization supports ad hoc initiatives and projects that approach but do not conform fully to ISO 14721/ISO 16363 specifications. There is an established basis for proactive and sustainable digital preservation improvement actions over time. Nevertheless, it is likely that some electronic records that merit long term retention remain at risk.

Stage 4: (Advanced) the organization has a robust infrastructure and the preservation of electronic records is undertaken within a governance and operational framework that conforms to most of the ISO 14721 specifications and the criteria of ISO 16363. Few electronic records that merit long-term preservation are at risk.

Stage 5: (Optimal) represents the highest level of sustainable conforming ISO 14721/ISO 16363 digital preservation capability and repository “trustworthiness” that an organization can achieve. No records that merit long-term retention are at risk.

What is a Digital Preservation System?

Among digital preservation practitioners and repository managers the ISO 14721, OAIS (Open Archival Information System) Reference Model¹ is well recognized as the de facto standard defining the processes for ingesting, preserving and providing access to digital content.



Open Archival Information Systems (OAIS) reference model : ISO 14721

There are six key functions within OAIS:

Ingest Steps required to transfer items from their current location into the preservation repository for archival storage in a managed manner

Archival Storage Storage of the bulk data/content (usually files) based on standard storage management tools

Data Management Tools to manage the storage of digital content, including the metadata

Administration Tools used to administer the system and access to it

Access Tools to search, browse and download the contents of the archive

Preservation Planning Management and migration of files formats as they become obsolete ensuring content can be accessed and read long into the future

A preservation environment that conforms to the OAIS specification could be implemented as a set of manual processes and collection of disparate tools. Alternatively, there are complete OAIS conforming digital preservation systems available that automate and integrate many of the processes and include all of the required preservation tools.

¹ ISO 14721 Open Archival Information System (OAIS) Reference Model http://www.iso.org/iso/catalogue_detail.htm?csnumber=57284

The Trustworthy Digital Repository audit and certification standard, ISO 16363², is also well accepted in the digital preservation community, especially in sectors (government and research) where transparency and accountability are critical. TDR focuses on defining the processes and practices needed for a reliable storage repository in three distinct areas:

- Organizational Infrastructure
- Digital Object Management
- Infrastructure and Security Risk Management

Organizational Infrastructure addresses management processes such as the appropriate policies, controls and governance for stewardship of digital content over time. A well-designed digital preservation system will implement most of the remaining TDR functionality.

Preservica³ is one example of a digital preservation system that has been specifically architected to meet the requirements of OAIS as well as offer a high degree of compliance with TDR recommended practices. The solution provides a comprehensive suite of automated workflows across the different OAIS functions and readily integrates with other systems, such as indexing and catalogs, Enterprise Content Management, (ECM), Records Management applications (RMAs) and Digital Libraries.



Example implementation of OAIS Reference model: Preservica

² ISO 16363 Audit and Certification of a Trustworthy Digital Repository http://www.iso.org/iso/catalogue_detail.htm?csnumber=56510

³ Overview of Preservica : How It Works <http://preservica.com/preservica-works/>

The Impact of Deploying a Standards-based Digital Preservation System

The Digital Preservation Capability (DPC) self-assessment tool¹ based on the DPCMM draws on the capabilities described in OAIS (ISO 14721) and Trustworthy Digital Repository (ISO 16363) audit and certification to assess an organization's digital preservation maturity level.

A complete digital preservation system that implements a significant proportion of the same standards should therefore have a notable impact on an organization's DPC index score.

It should be noted, however, that the DPCMM is not intended as a means of assessing the capability of a digital preservation product, but takes a more holistic approach, focusing on the need to have the correct processes and policies in place, as well as the human resources and technical environment to carry out and sustain preservation services.

Organizations that recognize the need for proactive digital preservation but do not yet have processes, policies or systems in place are likely to be operating at DPCMM stage 0 'Nominal'.

Shown on page 9 is the output of the Digital Preservation Capability (DPC) self-assessment survey completed by Preservica in December 2014. Charles Dollar and Lori Ashley, creators of the DPCMM, confirmed that Preservica's selection of statements that resulted in this scorecard are within the parameters of DPCMM performance metrics.

As can be seen, using Preservica can make a positive impact for a range of preservation infrastructure and services components – potentially enabling an organization to move from Nominal to Advanced/Optimal performance in 9 out of 15 key process areas (the green dots). You will notice there are components that scored in the red (Nominal) and yellow (Minimal) range. These are primarily concerned with policy, governance and collaborative engagement, which will be addressed in a later section.

¹ www.digitalOK.org

So for organizations currently operating at DPCMM stage 0 “Nominal” (where most long term electronic records are at risk), deploying a standards-based digital preservation system like Preservica could have the single biggest impact on ensuring valuable digital assets are safe for the long term.

Index Score Results	Nominal (0)	Minimal (1)	Intermediate (2)	Advanced (3)	Optimal (4)
DIGITAL PRESERVATION POLICY	●				
DIGITAL PRESERVATION STRATEGY		●			
GOVERNANCE		●			
COLLABORATIVE ENGAGEMENT	●				
TECHNICAL EXPERTISE					●
OPEN STANDARD TECHNOLOGY NEUTRAL FORMATS					●
DESIGNATED COMMUNITY	●				
ELECTRONIC RECORDS SURVEY	●				
INGEST					●
ARCHIVAL STORAGE					●
DEVICE/MEDIA RENEWAL					●
INTEGRITY				●	
SECURITY					●
PRESERVATION METADATA					●
ACCESS				●	

Preservica DPCMM Self-Assessment Score, December 2014

Where a Standards-Based Digital Preservation System Makes a Significant Impact

Preservica has been specifically architected for the needs of digital preservation - automating preservation processes and allowing management of long-term data, information and records to happen at scale with minimal manual intervention. In fact, using Preservica's OAIS conforming workflows will give an organization a foundation of best practice preservation processes and policies.

Preservation Planning

For example, Preservica does not place any restrictions on what can be stored in its repository which removes the initial need to develop and mandate a transformation policy. By contrast, the solution supports many different file format migrations allowing easy migration to preservation or presentation formats over time. This can be carried out during the initial ingest but also at any point in the future using simple workflows to allow policies to be applied retroactively.

Preservica mitigates many of the challenges around design of digital preservation processes and policy. Manual effort is eliminated by providing reporting on which formats are in the repository and an efficient way to identify formats at risk for migration and transform them at scale.

Technical Expertise

The Preservica development team actively monitors and regularly updates all of the preservation technologies used in the system. The system is architected to migrate content to new storage types as storage technology changes. These are just a few of the many advantages of using a fully supported commercial product.

This all means that an organization using Preservica with out-of-the-box functionality, which is backed by a team of digital preservation experts, will score well in the DPCMM components of external technical expertise, support for open standard formats, ingest, archival storage, device and media renewal, integrity security, preservation metadata and access.

Of course, beyond the system level there is still a need to develop a preservation policy and preservation strategy that reflects the organization's mission, vision and commitments to its stakeholders. The key is that these governance documents can start simple and evolve over time. Even if a preservation strategy simply stated 'use Preservica for digital records of long term value' this would enable the organization to support a preservation repository at DCPMM level 4 'Advanced'.

Where Organizational Processes are Essential

Evolving a long-term preservation policy and strategy over time is needed in order to address the organizational and operational challenges that a digital preservation system may simplify but will never completely solve.

For an organization already using Preservica this means potentially moving from DPCMM level 4 'Advanced' up to DPCMM level 5 'Optimal' for many components. There are four components, defined in DPCMM, that a digital preservation system may simplify but not fully solve: Governance, Collaboration Designated Community and Electronic Records Survey.

The impact that Preservica can have in each of these components is discussed below.

DPCMM Component	Preservica
Governance	Use of Preservica means keeping pace with technological change and being adaptable to organizational change.
Collaboration	Preservica fits into the existing IT infrastructure by integrating with existing databases, authentication systems, running on standard hardware and operating systems and operating through an easy to use browser interface.
Designated Community	Preservica makes it possible to ingest content from a wide range of stakeholders into the repository and provides ready access to a broad audience. Using Preservica will enable an organization to begin with a small group of stakeholders and then grow the community based on the ability to demonstrate a trustworthy and fully functioning system.
Electronic Records Survey	Preservica helps records and data managers move content into the repository, avoiding the risk of delay. Once a source is identified much of the ingest process can be fully automated ¹

These are all areas that also require specific organizational commitment in terms of assigning responsible people with specific expertise, defining policies, and implementing cross-functional business processes and controls. Preservica is an enabler to achieving success in these organizational areas by providing out-of-the-box tools to support these requirements.

In summary, delaying the deployment of a digital preservation system until all of the organizational requirements are fully met is likely to put long-term digital content at unnecessary risk. Start building digital preservation capability by putting a proven standards-based system in place - learning by doing can lead to a quicker, more considered and more successful end result.

¹ For example see Preservica SharePoint integration webinar
<http://preservica.com/resource/sharepointwebinar/>

Achieving a Higher DPCMM Rating

There are two specific areas where Preservica scored at level 4 'Advanced' (green dots) rather than level 5 'Optimal'. The DPCMM Access component requires support for redaction and the DPCMM Integrity component has a requirement to sign an AIP (Archive Information Package) with a digital signature. Addressing these two requirements could improve an organization's DPCMM score even further. However, is this functionality really needed in a digital preservation system?

Redaction

Redaction is the ability to identify and isolate personal information within data and is very important if there is a need to comply with data privacy law. Typically, when using a digital preservation system, redaction would be part of the pre-ingest process. However, Preservica is a workflow based system and could easily be adapted to automatically support redaction as part of the ingest process. This would be to identify, classify records and secure records containing personal information. Preservica could also be easily adapted to use redaction when exporting content to remove any personal information. The hardest part of this exercise would be identifying the most appropriate redaction tool to integrate.

Adding support for redaction is something that could be implemented in Preservica in the future if there is the tooling and sufficient customer demand.

Digital Signatures

One way of demonstrating the electronic chain of custody is through the use of a digital signature. Here each archival package has a digital signature that stays with the package, over time, as it has preservation actions performed on it. This is a useful addition if the preservation process is very manual or made up of a collection of disparate systems. Within Preservica all of the preservation actions are performed within the one system and this makes it possible to maintain a very detailed audit trail to support the chain of custody – given this the need to also support digital signatures is less compelling.

Conclusions

This assessment of Preservica against the Digital Preservation Capability Maturity Model (DPCMM) demonstrates that deploying a standards-based digital preservation system can enable an organization to achieve a significant step-change in their overall digital preservation capability – moving from ‘Nominal’ to ‘Advanced/Optimal’ performance in 9 out of 15 of the DPCMM components.

Preservica’s integrated suite of automated workflows across all the OAIS functions can form the basis of an organization’s digital preservation processes and policies – helping to further accelerate capability and adoption. Preservica can also be readily integrated into an organization’s existing information landscape – driving greater automation and return on investment.

In conclusion, given the risk that valuable content and records can be lost if deployment of a digital preservation system is delayed until all of the organizational requirements are fully met – a pragmatic and prudent approach might be to start by deploying a standards-based system, like Preservica, as soon as the need for long-term preservation is identified – and then build out from this platform to integrate the organization’s evolving digital policy and governance over time.

Useful Resources

Assessing Digital Preservation Capability Using a Maturity Model Process:
White Paper Charles M Dollar and Lori J. Ashley
www.securelyrooted.com/dpcmm

ISO 14721 Open Archival Information System (OAIS) Reference Model
http://www.iso.org/iso/catalogue_detail.htm?csnumber=57284

ISO 16363 Audit and Certification of a Trustworthy Digital Repository
http://www.iso.org/iso/catalogue_detail.htm?csnumber=56510

The Active Preservation of Digital Content - Preservica White Paper:
<http://preservica.com/resource/auctor-aliquam-white-paper/>

Preservica: How it Works
<http://preservica.com/preservica-works/>

About Preservica

Preservica is a world leader in digital preservation technology, consulting and research. Our active preservation solutions are used by leading archives, libraries, museums, governments and businesses across four continents to safeguard and share their valuable digital content, collections and electronic records for decades to come.

The award-winning Preservica active preservation and access technology is available in cloud hosted and on premise editions and includes a full suite of OAIS (Open Archival Information System) compliant workflows for ingest, management, storage, access and long-term preservation of digital content.

Preservica invests in numerous digital preservation research initiatives and is a well-respected member of many international collaborations with academia, archives, libraries and corporations at the leading edge of this emerging field. Preservica is part of Tessella group, a leading international analytics, software services and consulting company.