Digital Processing Framework

Development of the Digital Processing Framework began after the second annual Born Digital Archiving eXchange unconference at Stanford University in 2016. There, a group of nine archivists saw a need for standardization, best practices, or general guidelines for processing digital archival materials. Members of this group were already engaged in digital processing and had knowledge and experience with acquiring, preserving, and managing born digital content but had a lot of questions about processing this type of material and making it accessible. They sought commonalities for processing digital materials and wanted to create a framework that would be extensible, flexible, useful, descriptive rather than prescriptive, and as simple as possible.

CONTRIBUTORS

Archivists whose time and experience contributed to this framework are as follows:

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PURPOSE OF THE FRAMEWORK

The aim of the framework is to suggest a minimum processing standard, to promote consistent practice among digital archivists, to establish common terminologies that can be used in further development of best practices, and to enhance research access. The framework brings archival and digital preservation best practices together to clarify the relationship between these related activities and thereby help practitioners make informed decisions about their collections. "Processing," for the purpose of this framework, concerns activities that may overlap with other traditional archival functions including accessioning, preservation, and arrangement and description.

This framework is intended to be useful and used. It should be adapted to meet the requirements of a particular organizational context. The creators of the framework recognize its limitations and welcome additions, reuse, dismantling, and restructuring of the content contained within it.

DEVELOPMENT METHODOLOGY

The framework was developed through an iterative and collaborative process. An initial survey of literature for existing frameworks or practical guidance on minimal digital processing revealed a stark gap in practice. Based on the group members' personal experiences and local practices, we identified activities and tasks in common. These activities and tasks were further refined, eliminating references to technical solutions or local jargon. Simultaneously, we developed and refined a modular framework into which these activities and tasks could be presented in relation to levels of processing: baseline, moderate, and intensive.

AUDIENCE

This framework is intended for archivists who process born digital materials and who have some familiarity with digital preservation and/or management of digital collections. Users of the framework should be knowledgeable in OAIS terms and concepts and should have experience with born digital accessioning and digital preservation. It is intended for practitioners of archives who want to more systematically make digital material accessible. It is not intended for beginners and those unfamiliar with digital archive concepts, vocabulary, and phrases.

SCOPE OF THE FRAMEWORK

Recommendations and guidelines are presented for specific activities at different processing levels.
The framework includes:
- Twenty-three high-level <u>activities</u> that are common among repositories when processing digital material (e.g. survey the collection, capture digital content off physical media, create SIP).
- Discreet processing <u>tasks</u> that fall under the umbrella of each activity.
- Suggested level of processing for each task: baseline, moderate, and/or intensive. Certain tasks have multiple levels of processing. In these instances, additional information is provided specifying the differences.

This framework does not include:
- A comprehensive list of external tools, procedures, and standards that can be used for processing digital materials.
- A step-by-step procedure, workflow, or decision tree for how to process digital materials. Each repository has different tools for managing digital collections, which plays a significant factor in the steps archivists must take to get from point A to point B when processing. The framework's modular design could be a jumping-off point for creating local workflows.

TIER DEFINITIONS

Tier	Definition	Typically, collections processed at this level:
Baseline	This tier represents the minimum recommended processing actions that should be taken for any born digital material. These processing actions and methods do not typically require specialized tools and skill sets, and can usually be accomplished without substantial increases in funding or staffing.	• Should undergo these processing actions at a minimum • May have a low research value • Are low-risk (i.e. have no known copyright issues and do not contain sensitive, confidential, or personally identifiable information) • Can be made available as-is (i.e. require no restrictions or redactions)
Moderate	These processing actions and methods may utilize forensic tools and require specialized skill sets. Collections at this level require additional investment in time and resources.	• Are somewhat higher value • Are somewhat higher risk (i.e. may contain copyright issues and/or sensitive, confidential, or personally identifiable information) • May have some access requirements

	These processing actions and methods are the most time consuming and resource intensive; processing collections at this level typically cannot be accomplished without specialized tools and skill sets.	• Are high value and merit substantial investments of time and resources • Are high-risk (i.e. have copyright or legal concerns and/or contain copyright issues and/or sensitive, confidential, or personally identifiable information) • Have specific access restrictions or requirements that require a high degree of manual effort
Intensive		

LIMITATIONS OF THE FRAMEWORK

The framework has drawbacks and is not perfect. After two years of hard work which included monthly meetings, creation of sub-groups, external community feedback, and hours of discussion and debate over the design of and information contained within the framework, the group needed to finalize it and give it to the community for further development. Identified limitations include:

- The repetition of tasks in production workflows means the model contains duplication of tasks across activities (e.g. review collection documentation). This is both a bug and a feature.
- There may be tasks missing from activities that are key to a particular institution's workflow. We tried to strike a balance between granularity and oversimplification of processes, but something may have been overlooked
- The framework presents tasks in a static matter, making it difficult to restructure, reuse, or search for information.
- There is an inherent tension between archival processes, which work with aggregates, and preservation processes, which work on files as items. This tension is not easily mediated in the framework.

FRAMEWORK ACTIVITIES

Note: these are not in a meaningful order.

- Survey the collection
- Create processing plan
- Establish physical control over removable media
- Capture digital content off physical media
- Create checksums for transfer, preservation, and access copies
- Determine level of description
- Identify restricted material based on copyright/donor agreement
- Gather metadata for description
- Add description about electronic material to finding aid
- Record technical metadata
- Create SIP
- Run virus scan
- Organize electronic files according to intellectual arrangement
- Address presence of duplicate content
- Perform file format analysis
- Identify deleted/temporary/system files
- Manage personally identifiable information (PII) risk
- Normalize files
- Create AIP
- Create DIP for access
- Publish finding aid
- Publish catalog record
- Delete work copies of files

Survey the collection			
Associated tasks	**Processing Tiers**		
	BASELINE	MODERATE	INTENSIVE
Identify and document scope and content of collection materials	x Includes identifying all digital and, in the case of hybrid collections, physical materials		
Assess content of digital material for items that meet access restriction conditions including the presence of PII, copyright restrictions, or other restrictions set by the donor	x Here, assess if access restrictions may exist. If so, see additional activities (maybe)		
Determine presence of any digital-only components (e.g. website capture, social media download, etc)	x		
Determine total extent of digital material	x		
Gather collection-level information	x Could include information such as creator, title, and restrictions. Could be part of "Create processing plan"		
Determine estimated date range	x Determine approximate date range	x Determine accurate date range	
Review documentation relating to collection's provenance and accession and consult with individuals familiar with the collection (e.g. accession record, donor correspondence, surveys, curator notes, deed of gift, transfer agreements, etc)	x Cursory review of collection documentation	x Consultation with individuals such as the donor, accessioning archivist, etc.	
Determine types of physical media present	x At baseline, involves identifying and accounting for all physical media	x Determine the size, condition, format, and special characteristics of physical media	
Determine preservation concerns		x	
Document findings and save report with collection documentation.		x A report separate from and more detailed than the collection scope and content for the finding aid	
Research context of creator to determine if any original order present			x

Create processing plan

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Assess access needs	X		
Determine level of priority for processing	X		
Review documentation relating to collection's provenance and accession, and consult with individuals familiar with the collection (e.g. accession record, donor correspondence, surveys, curator notes, deed of gift, transfer agreements, etc)	X		
Establish scope and level of description	X		
Estimate necessary resources for processing project completion, including time required		X	
Identify relationship between analog and digital content		X	
Write summary of actions to be taken		X	
Discuss descriptive and arrangement needs with curator(s)			X

Establish physical control over removable media

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Identify physical media	x		
Assign unique identifier to each piece of media using institutional convention for determining identifier	x		
Create an inventory of each piece of physical media. Inventory elements can include: (1) Media type; (2) Capacity; (3) File system; (4) Manufacturer; (5) Date; (6) Any labels or identifying marks	x		
Transcribe annotations on media as metadata	x		
Add description of physical media to collection management system/catalog/database	x		
Remove old housing if unsafe or unstable	x		
Ensure hard drives are protected from dust, light, heat, and are stored with any necessary cables	x		
Label housing with identifier for media	x		
Record location of physical media in stacks	x		
Identify or create housing suitable for physical media	x House physical media in archival boxes or cartons	x House physical media in format specific containers	
Photograph media front, back, sides (if applicable) and related material such as CD inserts, jewel cases, sleeves, etc (if applicable)		x	
Assign photographs meaningful filenames based on physical media identifier		x	
Add the photographs of the physical media to the appropriate location for preservation and access		x	

Capture digital content off physical media

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Document source media	x		
Determine capture method	x		
Inspect media for degradation that may inhibit successful capture	x		
Capture content from physical media and transfer to new storage device. Possible methods include: (1) Copying relevant files using operating system tools (Finder, Explorer, cp on command line); (2) Copy relevant files using special copy tools (Exact Audio Copy, Teracopy); (3) Create disk image using tools (FTK, guymager)	x		
Determine disposition of media after capture.	x Keep or destroy media		
Record transfer results and failures	x Record success or failure		
Capture physical label as metadata	x Transcribe annotations	x Photograph media with its labels/metadata	
Verify completeness of capture.	x Verify number of files captured	x Verify with checksums post-capture	
Create an inventory of each piece of physical media. Inventory elements can include: (1) Media type; (2) Capacity; (3) File system; (4) Manufacturer; (5) Date; (6) Any labels or identifying marks	x Identify media type	x Identify easily identified characteristics of media carrier	x Identify technical details of media carrier
Troubleshoot and retry failed captures		x	

Create checksums for transfer, preservation and access copies

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Create checksum of files using one or more algorithm (MD5, SHA-1, SHA-256) at appropriate points in time: (1) Before transfer to archives; (2) After transfer to archives; (3) When new file is created in process of file normalization, redaction, packaging, etc.	x - Create MD5 checksum after transfer to archives	x - Create SHA-1 checksum before and after transfer to archive	x - Create SHA-256 checksum before and after transfer to archives as well as whenever a new derivative is generated
Document and store checksum for future validation. Methods can include: (1) In file manifest; (2) Alongside files packaged in SIP/AIP/DIP; (3) In collection documentation; (4) In collection management system.	X - Store checksum in collection documentation	x - Store checksum in collection management system	x - Store checksum alongside files packaged in SIP/AIP/DIP

Determine level of description

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Identify and document access and use conditions	x		
Determine if description of digital material is part of hybrid collection or separate finding aid	x		
Evaluate anticipated research value or demand for material	x		
Consider how level of description affects access mechanisms (finding aid, catalog record, institutional repository)	x		
Review documentation relating to collection's provenance and accession and consult with individuals familiar with the collection (e.g. accession record, donor correspondence, surveys, curator notes, deed of gift, transfer agreements, etc)	x - Review for minimal levels of description	x - Review for moderate levels of description	
Evaluate appropriateness of collection vs. series vs. file level description		x	
Research context of creator to determine if any original order present		x	
Survey existing file directory structure and file naming conventions used		x	
Evaluate if existing description can be reused		x	

ID restricted material based on copyright/donor agreement

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Determine appropriate actions to take with content containing restricted material	x		
Flag files that need to be restricted	x		
Note if materials are likely to contain sensitive information based on context of the donor or organization	x		
Review documentation relating to collection's provenance and accession and consult with individuals familiar with the collection (e.g. accession record, donor correspondence, surveys, curator notes, deed of gift, transfer agreements, etc)	x Review collection documentation such as deed of gift, transfer agreements	x Consult with donor	

Gather metadata for description

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Describe items that meet access restriction conditions including the presence of PII, copyright restrictions, or other restrictions set by the donor	X		
Document files that need to be restricted	X		
Review documentation relating to collection's provenance and accession and consult with individuals familiar with the collection (e.g. accession record, donor correspondence, surveys, curator notes, deed of gift, transfer agreements, etc)	X		
Standardize language used to describe metadata such as dates, digital extents, etc.	X		
Aggregate metadata description across collection when appropriate for scope and content or abstract (ex. dates, format types, extent, etc.)	x Aggregate date modified	X Aggregate metadata can be culled from file system information, embedded metadata, extracted text, etc.	
Determine if existing administrative and technical metadata (e.g. document author, location coordinates, etc) can be re-used for description		X	
Review file directory list and file tree to understand organizational method used by creator		X	
View and record file system properties in collection processing notes		X	

Add description about electronic material to finding aid

Associated tasks	Processing Tiers		
	<u>BASELINE</u>	<u>MODERATE</u>	<u>INTENSIVE</u>
Determine to what level of description information about electronic material will be added: (1) Collection; (2) Series; (3) File; (4) Item	X		
Add access statement to appropriate level(s)	X Note restrictions.		
Add dates to appropriate level(s)	X		
Add extent to appropriate level(s)	X Always include total gigabytes (GB) and total number of files.		
Add processing note to appropriate level(s)	X Include most important details (file normalization, unprocessed material, redacted material) and when/who processed the digital files.		
Add scope and content to appropriate level(s)		X Provide context of creation.	
Add use statement to appropriate level(s)		X When applicable and aligned with institution's internal policies on reproductions.	
Add arrangement note to appropriate level(s)		X Note whether original order has been maintained, and/or a brief statement on how materials are organized.	
Add formats of born digital material to appropriate level(s)			X Detailed information about file formats and associated software needs.

Record technical metadata

Associated tasks	Processing Tiers		
	<u>BASELINE</u>	<u>MODERATE</u>	<u>INTENSIVE</u>
Determine and document any necessary software or tools for viewing or use	x		
Record date and method of file acquisition or disk imaging	x		
Review documentation relating to collection's provenance and accession and consult with individuals familiar with the collection (e.g. accession record, donor correspondence, surveys, curator notes, deed of gift, transfer agreements, etc)	x		
Determine and record information such as: file names, file sizes, file paths, MAC dates, checksums, file formats, creating software, EXIF data, file system(s)		x	
Save technical metadata: (1) with other collection metadata; (2) in SIP package; (3) in AIP package		x	
Reuse technical metadata as descriptive metadata			x

Create SIP

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Document basic technical metadata	x - Record basic information about the tools and technical processes used to create SIP		
Document checksums of content	x		
Package content and metadata as SIP	x		
Document basic administrative metadata	x - Record basic rights information and access requirements	x - Record any additional administrative metadata specific to the project or collection in question (e.g. selection criteria or archiving policy for digital content)	x - Assign and record persistent identifiers to digital objects
Describe the contents of the SIP		x - Describe content of SIP in collection management system (if retaining)	
Move SIP to non-temporary storage		x - Move SIP to permanent storage (if retaining)	

Run virus scan

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Document results of virus scan and actions taken.	x		
Run a virus scan on the processing station before processing a collection	x		
Use recommended/standard malware software to check for any viruses/malware present on transferred content before copying to processing station	x		

Organize electronic files according to intellectual arrangement

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Determine whether intellectual arrangement or level of description warrant moving electronic files into new arrangement for preservation and access	x		
Identify relationship between analog and digital content	x		
Determine if existing order should be kept, revised, or if archivist should impose new order	x This decision should be considered as a baseline requirement, even if the decision is "keep as is"		
Describe digital content at the appropriate aggregate level	x Baseline level is a collection scope and content note or similar level	x Moderate level is series or folder level	x Item level
Create file directory list		x Whether the archivist chooses to conduct more in-depth processing or not, creating a file directory list can be easily accomplished with open source tools and should be part of moderate processing workflows. Also part of "Create DIP" activity	
Create new folders or file hierarchy (to mimic arrangement in intellectual arrangement/description?)		x Equivalent to folder level arrangement	
Describe system of arrangement as it exists		x Arrangement note, according to DACS, is added-value element; Arrangement note is "Recommended" by UC Guidelines	
Review files and plan appropriate levels of arrangement		x After decision to revise arrangement is made, plan for arrangement (series, sub-series, folder) prior to moving files/folders	
Identify like content for intellectual arrangement		x Would only do this if you were going to arrange files differently from original order	
Describe physical and digital content under the appropriate level		x Series or folder level	x Item level
Move and sort files according to intellectual arrangement			x Item-level arrangement

Address presence of duplicate content

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Assess contextual and information value of duplicate content to determine if duplicates should be weeded		x	
Document decision in collection documentation and in finding aid/catalog record.		x	

Perform file format analysis			
Associated tasks	**Processing Tiers**		
	BASELINE	MODERATE	INTENSIVE
Run file format identification and verification tools to determine original file formats	x		
Analyze results for preservation risks.		x	
Document formats found at appropriate descriptive level(s).		x	
Identify file formats		x	
Reconcile file format identifications if more than one result			x
Validate files using one or more tools to look for invalid or poorly formed files			x

Identify deleted/temporary/system files			
Associated tasks	**Processing Tiers**		
	BASELINE	MODERATE	INTENSIVE
Run tools to identify file formats indicating: (1) Temporary files; (2) Deleted files; (3) System files; (4) Hidden files; (5) Duplicate files		x	
Appraise system-generated files		x	
Appraise found files.		x	
Apply disposition of files as needed.		x	

Manage PII risk			
Associated tasks	**Processing Tiers**		
	BASELINE	MODERATE	INTENSIVE
Review existing restrictions in finding aid, accessioning notes, or processing notes	x		
Review collection file for likely risks (deed of gift, digital materials survey, emails between donor and curator, accession form)	x		
Identify the type of PII	x		
Assess potential risk	x		
Flag files with positive results following human review	x - At a minimum, all collections can be reviewed for PII by an archivist by simply opening the (write-blocked) files and looking at them		
Document disposition	x - If files are deleted, restricted, or redacted note this in the Processing Information note and/or the Conditions Governing Access note in the finding aid, as well as in your collection management system and the collection file. This information should also be included in the finding aid.		
Determine statute and/or policy governing data	x - Determine the law or policy that's relevant to the PII at hand (e.g. HIPAA for medical info, FERPA for student records)		
Search digital material using tool (select tool appropriate to risk and format)	x - Do standard PII pattern search (e.g. credit card numbers, date of birth, social security numbers, etc.) and delete, restrict, or redact accordingly.	x - Do enhanced PII pattern search (e.g. phone #s, bank account #s, emails) and delete, restrict, or redact accordingly.	x - Do standard PII pattern search in addition to performing relevant keyword searches
Determine and implement disposition as required	x - Delete/deaccession at file/folder level	x - Restrict (object/series/collection)	x - Redact (remove specific information) within a single file)

Normalize files

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Document original file formats	x		
Document normalization process - normalization processes should be described for content regardless of processing level.	x		
Validate new files		x - Small collections and lower-lift normalizations, eg text-based documents	
Identify normalization path		x - Small collections and lower-lift normalizations, eg text-based documents	x - Proprietary/complex files, large collections
Identify software needed to normalize to each target file type		x - Small collections and lower-lift normalizations, eg text-based documents	x - Proprietary/complex files, large collections
Identify target/preservation file formats		x - Small collections and lower-lift normalizations, eg text-based documents	x - Proprietary/complex files, large collections
Migrate files as needed		x - Small collections and lower-lift normalizations, eg text-based documents	x - Proprietary/complex files, large collections

Create AIP

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Determine if you will preserve original file(s) or only normalized files.	x		
Create checksum of AIP package	x		
Create checksums for all files in AIP	x		
Gather AIP contents together for packaging. Contents can include (1) Original transferred files; (2) Disk image(s); (3) Files normalized for preservation; (4) Redacted files; (5) Files normalized for access; (6) Metadata about the objects (technical, descriptive, administrative); (7) Documentation about preservation, arrangement and description activities (logs, virus scan report, transfer documentation, file renaming etc.)	x		
Package AIP contents together. Methods for packaging can include: (1) Bag-it (or bagger); (2) Bundles files into a container file such as .tar or .zip	x		
Transfer AIP to preservation storage	x		
Verify AIP package checksum	x		
Create or pull together already created metadata: (1) Technical; (2) Descriptive; (3) Administrative	x Descriptive and Administrative metadata comes from collection-level information. Technical metadata limited.	x Descriptive metadata may come from directory list of folder or file names. Technical metadata may include file identification output.	x Descriptive metadata may come from extracted metadata or be created specifically for AIP
Create access versions of files contained in AIP		x	

Create DIP for access

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Document access and use conditions	x		
Review documentation relating to collection's provenance and accession and consult with individuals familiar with the collection (e.g. accession record, donor correspondence, surveys, curator notes, deed of gift, transfer agreements, etc)	x		
Capture file-system metadata associated with the directory tree		x	
Create file directory list		x	
Create final access file list		x	
Determine access format(s)		x	
Package access files as DIP		x	
Transfer files to delivery mechanism		x	

Publish finding aid

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Create or edit EAD	x		
Publish EAD to publicly available environment	x		

Publish catalog record

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Create or update collection level MARC record	x		

Delete work copies of files

Associated tasks	Processing Tiers		
	BASELINE	MODERATE	INTENSIVE
Confirm that preservation and access copies are stored in the appropriate locations	x		
Document that work copies were deleted		x	
Securely delete working copies from workstations			x

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