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Where There's a Will, There's a Way: In-House Digitization of an Oral History Collection in a Lone-Arranger Situation

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Abstract

Analog audio materials present unique preservation and access challenges for even the largest libraries. These challenges are magnified for smaller institutions where budgets, staffing, and equipment limit what can be achieved. Because in-house migration to digital of analog audio is often out of reach for smaller institutions, the choice is between finding the room in the budget to out-source a project, or sit by and watch important materials decay. Cost is the most significant barrier to audio migration. Audio preservation labs can charge hundreds or even thousands of dollars to migrate analog to digital. Top-tier audio preservation equipment is equally expensive. When faced with the decomposition of an oral history collection recorded on cassette tape, one library decided that where there was a will, there was a way. The College of Education One-Room Schoolhouse Oral History Collection consisted of 247 audio cassettes containing interviews with one-room school house teachers from 68 counties in Kansas. The cassette tapes in this collection were between 20-40 years old and generally inaccessible for research due to fear the tapes could be damaged during playback. This case study looks at how a single Digital Curation Librarian with no audio digitization experience migrated nearly 200 hours of audio to digital using a $40 audio converter from Amazon and a campus subscription to Adobe Audition. This case study covers the decision to digitize the collection, the digitization process including audio clean-up, metadata collection and creation, presentation of the collection in CONTENTdm, and final preservation of audio files. The project took 20 months to complete and resulted in significant lessons learned that have informed decisions regarding future audio conversion projects.

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Introduction

Analog audio materials are notoriously fragile. Mechanical concerns as well as format degradation threaten the long-term accessibility of analog audio information. In most cases, migration to digital is the best hope for preserving access to that information. For smaller institutions, lack of equipment, training, funds, and appropriate storage facilities seriously inhibit audio preservation activities. The university archive which undertook this project is home to several aging analog audio collections. Lack of budgetary support for outsourced digitization effectively rendered inaccessible a large collection of oral histories created by the university's Teacher Education Department. This collection contained individual interviews documenting the experiences of one-room schoolhouse teachers collected over the course of 30 years. The information was of significant research value and irreplaceable. While creation of a high-tech audio digitization lab was equally out of reach, research suggested that in-house digitization was still possible, and that a quality preservation and access to files could be produced in-house at reasonable cost. The subsequent project lasted 20 months and during that time, a lone digital curation librarian migrated nearly 200 hours of content from analog to digital using a $40 audio converter from Amazon.com and a campus subscription to Adobe Audition. The end result was a collection of digital oral histories comprised of access-quality .mp3s along with their preservation master files that met minimum industry standards for audio preservation. This successful project laid the groundwork for further audio preservation projects that were previously unattainable by the institution.

History of the Collection

The College of Education One-Room Schoolhouse Oral History collection contains 247 individual audio cassettes recorded between the years of 1978 and 1997. These cassettes contained oral history interviews with one-room schoolhouse teachers from 68 different counties in Kansas. The interviews were originally recorded by individual master's students on a myriad of personal equipment in casual settings. There was little attention given to recording environment and so sound quality varied greatly between the interviews. The cassette tapes were initially stored in a limestone schoolhouse where they were exposed to environmental stressors due to the uncontrolled environment in the building. Approximately ten years ago, the cassettes were moved to the university archives for preservation. Initial attempts at digitization were poorly executed. In 2013, a selected group of 13 cassettes were sent to a private company for digitization, however, budgetary constraints prevented digitization of the entire collection. The original 13 files were uploaded to a collection presented in CONTENTdm, but their large file size made streaming or downloading burdensome. There was little metadata presented with the files themselves and so the collection remained nearly unusable. The original master files were eventually lost due to equipment failure and further plans for digitization were abandoned.

Decision to Digitize

Fears regarding the stability of the magnetic audio format along with concern for the physical carriers rendered the collection inaccessible to researchers. A 2017 assessment of the collection revealed that the physical carriers of the cassettes were in relatively good shape, however, the earliest recordings were showing signs of audio degradation from demagnetization. The lifespan of analog audio materials is not fully understood as magnetically recorded media is a relatively recent human invention. Under the best-case scenario, audio tapes may only last 50 years, while collections that have been housed under less-than-ideal conditions can degrade after a decade. (Van Bogart, 1995). Items in this collection ranged between 20-40 years. For many years the collection was housed in an uncontrolled environment and the tapes were subjected to large variations in both humidity and temperature. Because of this, the collection was designated as having a high-risk of loss, and the conversation regarding digitization reopened.

Barriers to Outsourcing Digitization

Lack of budgetary support remained the single greatest barrier to outsourcing digitization of this collection. Research suggests that this is the norm for most libraries. In his 2009 study of challenges facing digital preservationists, Singh cites a survey suggesting that fewer than half of institutions surveyed had budgets supporting their full preservation needs (Singh, 2009). This was certainly the reality for this institution. A bid from an outside digitization lab for a similar collection owned by the archives came in with a price tag of $57.95 per tape. Total cost of digitization for that collection would have exceeded $14,000. This was the equivalent of the entire inter-library loan budget for the same year. Grant-writing for digitization projects is time consuming and digitization grant opportunities are highly competitive. Other collections had been placed in line before this particular collection for grant-writing efforts. With the timing of the grant cycle and the variable nature of the availability of grant funds, reliance on grant funding would have added another two to five years onto the digitization timeline. For high-risk collections, a two- to five-year wait could result in the complete loss of irreplaceable data.

Feasibility of In-House Digitization

Reluctance to let this collection sit in its current condition fueled the decision to explore in-house digitization in the absence of a full audio digitization lab staffed by audio experts. The goal was to see if a "good enough" solution could be achieved. Cohen (2001) stresses that migration must be undertaken in order to safeguard audio recordings and that the "acoustopolitical issues" surrounding migration are theoretical and not practical. She argues that delaying migration on the grounds that transfer may be done using less-than-ideal methods will prevent the majority of audio materials from being preserved, thus leading to an unacceptable loss of data. Ultimately, the goal of preservation is to provide continued access to material that would otherwise be inaccessible or lost due to deterioration. Casey and Gordon (2007) disagree with Cohen when they argue that preservation is only truly achieved when migration produces a copy of exceptionally high quality. In 2015, a study by Cocciolo found that users listening to digitized oral histories could not tell the difference between the archival quality master and a lower quality access copy (Cocciolo, 2015). This demonstrates that

the ultimate goal of access could be achieved in the absence of a near-perfect archival migration. Taken together, this suggested that "good enough" could be achieved in-house.

In-House Digitization

Given the budgetary concerns, the preservation needs of the collection, the research value of the collection, and the possibility that in-house digitization was indeed feasible, the decision was made to move forward with an in-house digitization project. The budget for the project was limited to what could be purchased under existing line-items for equipment and materials. There was no additional budget for training or other outside resources. The Digital Curation Librarian had free reign to design the digitization process and make all quality decisions. The Digital Curation Librarian and a single student worker, neither of whom had any previous experience with audio transfer, were charged with creating and executing an audio digitization plan that met the bare minimum standards for archival quality audio migration.

Equipment Decisions

Equipment decisions came first to the forefront. The expense of audio digitization equipment is one of the major barriers to in-house digitization. Equipment setups that use a microphone, or mic-in setups, require many more components to work properly and so they inevitably cost more. They also require a far more controlled sound environment to produce a high-quality recording, as well as an experienced audio technician to run the equipment. Given that a dedicated audio-digitization lab with a resident audio technician was out of reach, a mic-in setup was not a good fit for this project. Some audio digitization equipment can record directly to digital. These direct recordings, or line-in setups, transfer the audio data directly to a computer and so they are not dependent on the sound environment for recording quality. They are also far less expensive than mic-in setups because they often only require the converter and a USB cord. In both cases, audio manipulation software is required to control recording and editing of the post-migration file.

Ultimately, the line-in solution was selected. Budgetary constraints immediately ruled out purchasing most professional-level equipment. Consumer reviews indicated that many non-professional quality machines could achieve high quality results given the correct set up and audio recording software. In 2018, the library purchased a ReShow USB Cassette Capture cassette converter from Amazon.com for $36.99. The converter came with a USB cord, however, a shielded high-speed USB cable optimized for audio was purchased for $14.99 through Amazon to replace the native cord. This cord replacement was deemed necessary to create the highest-quality transfer that could be produced from the device. The converter came with its own proprietary audio editing software, but the software lacked the ability to create a master file compliant with desired archival standards. The university makes available Adobe Creative Cloud to faculty, and so it was decided to use Adobe Audition as the audio recording and editing software for no additional cost.

Recording Quality Decisions

Recording quality choices required extensive research and conflicting information complicated the decision. While there is a recommended best practice standard for file type (PCM.wav), there is no best-practices standard for recording quality of preservation audio files. There is also considerable debate within the preservation community as to what the standard should be. Casey and Gordon (2007) insist that 44.1 kHz with a bit depth of 16mbps is insufficient for audio preservation purposes. They rely heavily on Pohlmann's (2006) discussion of audio quality which indicates that a higher capture frequency is necessary to preserve the full range of sound present in any given recording. Both Casey and Gordon, and Pohlmann strongly advocate for a recording standard of 96 kHz with a bit depth of 24mbps. Weig et.al. (2007) argue that for spoken-word audio preservation, the 96/24 standard is unnecessary given the capabilities of human hearing. Humans do not reliably hear frequencies above 20 kHz. As such, any capture above 40 kHz should be sufficient for listening purposes. Standards from the International Association of Sound and Audiovisual Archives (IASAA) suggest a middle ground of 48 kHz with a bit depth of 24mbps though they do acknowledge that the 96/24 standard is commonly used (Prentice and Gaustad, 2017). While Casey and Gordon believe the inclusion of audio artifacts like hisses and pops are important for true preservation, Weig et. al. disagrees and argue that those inclusions add little to the final product. The IASAA guidance indicates no differentiation should be made between music and spoken-word recordings. Given Cocciolo's (2015) conclusions that most patrons could not tell the difference in recording quality above 44 kHz, it was determined that anything above 44/16 would be sufficient for audio masters produced during this project.

Digitization Process

Creation of Master Files

For the duration of the project, recordings were transferred into Adobe Audition using the ReShow converter at 48 kHz with a bit depth of 24mbps. This reflects the middle-ground of the ISAA standard. The recordings were saved as a PCM.wav file with metadata relating to the originating institution and transfer date encoded as metadata in accordance with Casey and Gordon's (2007) best practices. The ReShow converter was connected directly to a Dell Optiplex 5060 with an Intel Core i7-8700 CPU 3.20GHz processor and 16 GB of RAM. All files were recorded using Adobe Audition 2018. The Digital Curation Librarian monitored the file transfer in real time by listening through headphones and observing the wave form and spectral frequency display. Recordings were given a three-second buffer before playback began in order to produce a noise pattern sample for later audio clean-up. Recordings were continuous and were ended when the audio ended. The final result consisted of 245 individual master files containing 196 hours of unedited raw transfer material comprising 261 GB of data.

Preservation of Master Files

Upon completion of the audio transfer, the raw master files were ingested into the archive's priority preservation system. Files in this system are uploaded to DuraCloud

where fixity and file health is monitored by a third party. A local copy exists on the university's preservation server with a backup copy existing on a server node in a geographically distant location. This reflects the library's best attempt to adhere to the National Digital Stewardship Alliance (NDSA) recommendations for digital preservation (NDSA, 2018). The individual files were named using the archival accession numbers so as to maintain the connection to their physical counterparts. Metadata for original creation date was embedded within the files themselves, while a copy of descriptive and administrative metadata was preserved along with the preservation masters as a comma separated value spreadsheet. These master files are available upon request to researchers who prefer an unedited copy.

Creation of Access Files – Audio Clean-up

While the final preservation-quality master files effectively saved the audio contained on the cassettes, the resulting files were too large and not of sufficient quality to make an attractive digital collection. The large size of the files and the .wav format rendered them unsuitable for streaming or download. The degraded audio quality on some of the files due to the condition of the original cassettes, as well as electrical background noise from the transfer itself, made listening to some oral histories difficult. To facilitate listening and create a better user-experience, access files were created from a copy of the preservation masters. Using Adobe Audition, the Digital Curation Librarian was able to use the three-second lead-in of each recording to capture a noise print of the transfer noise of the machine itself, and digitally remove it using native noise reduction features in Adobe Audition. A second noise print was taken of the lead-in of the original cassette before audio began. This second removal of background noise was sufficient to improve the audio quality of the majority of transfers.

A limited number of transfers required the use of the Speech Volume Leveller effect to enhance audio to the point where casual listeners could understand most of the interview. Some of the oldest cassettes from the late 1970s had significant audio degradation, and the final product was difficult to understand even after audio enhancement. Some interviews took up more than one tape, and so they were stitched together to create a single continuous file for access. Dead air was removed from the beginning and the end of files. Long pauses during interviews were removed. No speech was removed. Some cassettes had unrelated content later in the tape after the oral history interview concluded and on B-sides. This included unrelated conversations between students, recordings of radio programs, orchestral recitals, and church services. This material was removed for the final access copy. Descriptive metadata for these files documented the removal and that the preservation copy contained more material. Upon the completion of the audio clean-up, the .wav files were converted to .mp3 format with a bit rate of 192kbps to facilitate streaming.

Public Facing Digital Collection

Final access files along with descriptive metadata were uploaded to the library's instance of CONTENTdm.[1] Metadata that included dates, geographical locations, school names, and name date for interviewers and interviewees were collected by a student worker. There were no transcriptions for the interviews available, and limited resources prohibited the creation of transcriptions. Automatic transcription is not a viable option

1 The collection is now accessible at: https://scholars.fhsu.edu/ors/

given the audio quality of the original tapes, and human transcription is prohibitively expensive in both time and resource allocation. A future volunteer or crowd-sourced transcription solution is a possibility. The final collection features 213 files available for streaming and download.

Lessons Learned

Many lessons were learned along the way. The first is that functional in-house digitization of audio is possible. The 20-month long time period for project completion does not reflect continuous work on the project. Calculating actual hours spent on audio transfer, combined with an equipment investment of under $50, this project cost an estimated $36.80 per tape to produce versus the $57.95 per tape quoted by the outside vendor. Recording quality continues to be an area of debate. For a smaller institution, the 48/24 standard is achievable given commercially available equipment. This does not rise to the level of the platinum standard for audio preservation at a cultural heritage institution, but it is "good enough." Subsequent in-house studies have shown that the equipment used for this process will produce a 96/24 copy, but current high-priority data preservation capabilities render audio transfer at that level unsustainable. Subsequent tests have shown that electrical background noise from the equipment itself can be reduced by using an external power source as opposed to powering the audio converter through the USB cord used for audio transmission. This produces a cleaner master copy and reduces the audio clean-up time for access files. Not enough metadata was embedded within files for this collection. Future collections will have transfer quality information embedded along with the original file name, date, and file creator. This will ensure that preservation master files and subsequent access copies come as close to the platinum standard as possible given institutional capabilities.

Conclusion

The ultimate goal of the project was achieved. Analog oral history cassette tapes were successfully transferred to digital, were preserved, and were presented as a publicly accessible collection. As of August 2020, the collection has received nearly 3,000 unique page views according to information gathered from Google Analytics. This has become one of the more popular collections for web visitors, and community feedback has been positive. The lack of solid audio transfer standards and a lack of acknowledgement of the budgetary realities facing cultural heritage institutions within the literature complicated project planning decisions. Most of the preparation effort was centered on determining if "good enough" as a standard existed, and if it was achievable given available resources. The final determination was that yes, "good enough" exists, and it can be achieved through readily available means. The process highlighted several areas for improvement and future collections will be preserved more efficiently and to a higher standard as a result. Future scholarship in this area is needed to create workable standards for smaller institutions that cannot afford the creation of top-tier audio transfer facilities employing sound engineers or the price tag of outsourcing. The introduction of such standards could save untold numbers of irreplaceable audio recordings at institutions that serve the most vulnerable populations.

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