

Digitization of Intangible Cultural Materials at Music Museum of Nepal for Preservation and Common Access

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Abstract

Background: Magnetic tapes were the major source of analog recording devices, until digital media storage devices arrived. Songs, dances and other cultural performances recorded in such analog materials are of high cultural importance as most of the performers aged or died. However, modern youth are slowly leaving such cultural traditions. On the other hand, westernization of culture is further deteriorating the traditional eastern folk culture. The intangible cultural heritages are in dire need of preservation through scientific means from being vulnerable and lost.

Purpose: The paper discusses the archival works that underwent at Music Museum of Nepal to restore analog audio and video materials. The details of the process are mentioned, along with background of the museum and preservation techniques for new researchers.

Methods: In order to get the appropriate data, a list of well structured questionnaires, multiple interviews with concerned persons and other observatory methods were implemented as research tool.

Result: The research paper investigated the detail process and approaches the museum adapted to digitize and archive its cultural assets. Similarly, a number of problems discovered and faced during the archival process are mentioned in a way to assist the new archivists and culturists.

Novelty: The research provides insights into the use of new technologies adapted in Nepal for the transformation and preservation of analog media into digital assets, which include invaluable information about intangible cultural heritages. Similarly, technicians and researchers working in the field of audio and video signals are likely to be helped from the research.

Keywords Intangible cultural heritage, analog, safeguard, sampling, reel

Introduction

The restoration of democracy in Nepal in 1951 after the end of 104 years long Rana regime brought freedom to media. In the same year, the first broadcasting station of Nepal, Radio Nepal, was established. Earlier Nepalese artists used to record their songs at Calcutta or other Indian cities. Seturam Shrestha, Melwa Devi were some of the popular artists whose songs were recorded on gramophone discs in India due to the lack of recording studios in Nepal. Radio Nepal was established in 1951 and opened a new platform for Nepalese artists, where their songs used to be recorded and broadcasted. However, the only recording studio of the country was not enough platforms for the growing artists. An extra recording studio was established by the then government of Nepal in 1961 under the name of Ratna Recording Corporation ([Pokhrel, 2021](#)). During 1980s, some new private recording studios established in the country. Music Nepal was one of them. Similarly, introduction of new devices like Panasonic Cassette Recorder in 1970s also contributed to the personalization of recording system ([UNESCO, 2024](#)).

On the other hand, the discovery of moving image made people to believe that performance can not only be recorded as audio but can also be visualized. British rule in India became the major factor for introduction of such new technologies in South Asia, and the wave also somewhat affected the minds of Nepalese. Dutch ethnomusicologist Dr Arnold Adrian Bake arrived Nepal in 1930s and began recording religious and cultural moving pictures in wax cylinders and '16mm black and white and color silent film materials'. However, a number of wax cylinders mechanically degraded before reaching to Europe and sound recordings were lost. Some of the survived recordings and films were later archived by British Library ([British Library, 2017](#)).

Field recordings was not common in the country until the mid 1960s, when Terence R Bech arrived in Nepal as a Peace Corps Volunteer was fascinated by the folk culture of the country. This made him to travel across Nepal about 15000 kms, recordings folk songs and performances on Uher open tape reel machine. His recordings of performances and life stories comprise about 260 hours. The asset was later donated to Indiana Library where the archiving of it is still going on ([Indiana University Bloomington Library, 2026](#)).

Similarly, sound films gained popularities in South Asian countries during the 1940s ([Salt, 2014](#)). The first Nepali language movie, Satya Harischandra, was made in 1951. The first color movie in Nepali language was Kumari. On the other hand, the arrival of video cameras in Nepal helped people to record video through private sectors. However, television was introduced late in Nepal in 1983 but it became a major source of broadcasting Nepali songs and cultural videos through different programs ([Onlinekhabar, 2023](#)).

Literature Review

As the world transited to digital media from analog materials at the end of 20th century, researchers and culturists around the globe tried to implement the discovered digital media platforms for the conservation and preservation of intangible cultural heritages. There were a

lot of difficulties encountering new technologies for archive and digitization. On the other hand, preserving the delicacy of analog material which had to be archived was a major challenge, as a simple mistake could make it lose forever while implementing new technology. Thus, researchers at first tried to study the work those institutions which carefully and successfully managed to archive the delicate analog materials. Similarly, common technical errors and difficulties were also vividly studied.

[Giri\(2021\)](#) investigated the challenges in preservation and digitization of musical resources for Nepali Music industries. The major problem identified was Nepali Music Industries were not fully capable for digitizing the resources due to lack of skilled manpower and economic source. Another problem was the lack of legitimate music business due to digital financial transaction barrier. The researcher also proposed some solutions to overcome the problem through investigation of musical industries of neighboring countries, which were digitally and economically successful. On the other hand, [Ghimire\(2023\)](#) studied on the possibility of the use of new and sophisticated technologies for preserving cultural assets in Nepal. The researcher particularly focused on attempts made by the country in digitizing and preserving cultural heritages, which were badly hampered due to 2015 earthquake. Accordingly, the researcher also pointed vivid strategies for handling and safeguarding cultural heritages in the near future, so that they may be available to newer generations for centuries. Similarly, [Liu\(2023\)](#) studied on importance of digitization of audio and video media in the field of cultural and scientific research. The researcher conducted a questionnaire survey to investigate the problems faced in digitization and suggested a practical solution for digitization and future research. Copyright protection and data security methods were also discussed to solve the common problems faced during digitization. Accordingly, [Stirr\(2025\)](#) studied on the evolution of Nepali music industry from 1980s to till date, from analog to digital format. The major challenging in transferring the music industry from analog to digital format were identified. The importance of visual in music industries was also studied and found that viewers expect to view the song alongside hearing. Similarly, [Kuan et al.\(2025\)](#) studied on digitization of intangible cultural heritages in two different countries, China and Pakistan. In recent years, the Belt and road Initiative (BRI) has brought cross broader exchange of both culture and technology. The research paper discussed on similarity and contrast of two different cultures, and the use of technology to preserve them. The study also focused on the exchange of new emerging digital technologies like Artificial intelligence (AI) and three dimensional scanning to digitize and safeguard cultural property.

The research paper tries to address the problems and challenges faced during archival of analog materials in Nepal. The researcher is the first of its kind in Nepal, especially in the field of digitization of both audio-visual materials according to international standards. Similarly, only a few researchers have tried to study about the status of analogically stored intangible cultural assets in Nepal. The research paper discusses the detail process involved and proposes some suggestions that would make easy for the new researchers and culturists who are trying to archive intangible cultural heritages, especially in the countries like Nepal where digital techniques and equipments are limited.

Objectives of the study

The objectives of the study can be summarized into following points.

- i) To know the background of the museum, its necessity of establishment and its story of archiving movement.
- ii) To know the digitization projects it has successfully conducted to preserve intangible cultural heritages.
- iii) To identify the materials and methods required to convert analog materials to digital format.
- iv) To discover necessary suggestions and recommendations for new researchers and culturists, who are willing to digitize and archive the analog collection.

Materials and Methods

The following research paper is a case study to evaluate the digitization program of Music Museum of Nepal. After a thorough investigation of associated literary works and research paper, a well-structured questionnaire was prepared. The founder of the museum, Mr. Ram Prasad Kadel, also helped to strengthen the feasibility of the questionnaire. Also, a pilot study was conducted to finalize the questionnaire. Qualitative data adapted from the questionnaire included detailed information about the projects' date, materials used and preservation methods. All the pictures and necessary statistics were collected from the library of the museum, with the help and authority of the founder and other working staffs.

An Overview of Music Museum of Nepal and its story of Archiving Movement

Ram Prasad Kadel in 1995 established a new organization named Music Museum of Nepal with an objective of collecting and preserving Nepali folk music instruments. He soon realized that not only folk instruments, but there is a dire necessity of preserving Nepali songs, dances or other performances which reflect the unique culture of the country. He then started to collect magnetic tapes of folk music audios and videos, in an attempt of digitizing later. Upon his request, Researchers and Collectors donated a large number of such magnetic tapes. Additionally, Ram on his own visited several villages of Nepal recording folk songs and cultural performances in audio cassettes and mini DVs. The museum was not economically strong, so it could not archive the collected materials on its own. The work was later archived with the help of British Library.

Analog to digital transformation(A/D transformation)

Analog signals are continuous and noisy. On the other hand, the information stored in analog materials is vulnerable to be lost in time due to physical factors like temperature and eroding. ([Donaldson et al., 2018](#)). Thus, analog signals are to be converted into digital form for a better archiving. The process of conversion of analog to digital form includes three main phases; sampling, quantization and encoding. The encoded signal as digital form is now stored memory devices, through where it can be copied, or processed further for refining ([Mano, 2017](#)). The analog signals are sampled with sampling pulses where sampling circuit generates a sufficient number of discrete values. The sampling rate is fixed as per as the Nyquist rate or condition. The Nyquist condition suggests the sampling frequency must be greater than twice

the maximum frequency of analog component. For example, the sampling rate of 48kHz captures frequencies of about 24 kHz as criteria is $f_{\text{sample}} > 2f_{a(\text{max})}$, where f_{sample} refers to sampling frequency and $f_{a(\text{max})}$ refers to highest frequency component of the analog signal ([Lathi et al., 2021](#)). Thus A/D conversion is equipped with anti aliasing filter (AAF), which is used to restrict the signal bandwidth and satisfy the Nyquist condition. It is used before the analog signals are sampled. The information stored in cassettes, reels, vinyl/LP or other analog media undergo through two important phases inside the A/D conversion, first anti aliasing filtration and next 'sampling and holding' ([International Association of Sound and Audiovisual Archives, 2026](#)). The holding process is one of the important part of A/D conversion, where initially sampled level is held constant until the next sample occur. This provides a time to process the sampled value. The sample and hold approximation maps the initial analog signal to a stair step wave ([Tokheim et al., 2022](#)).

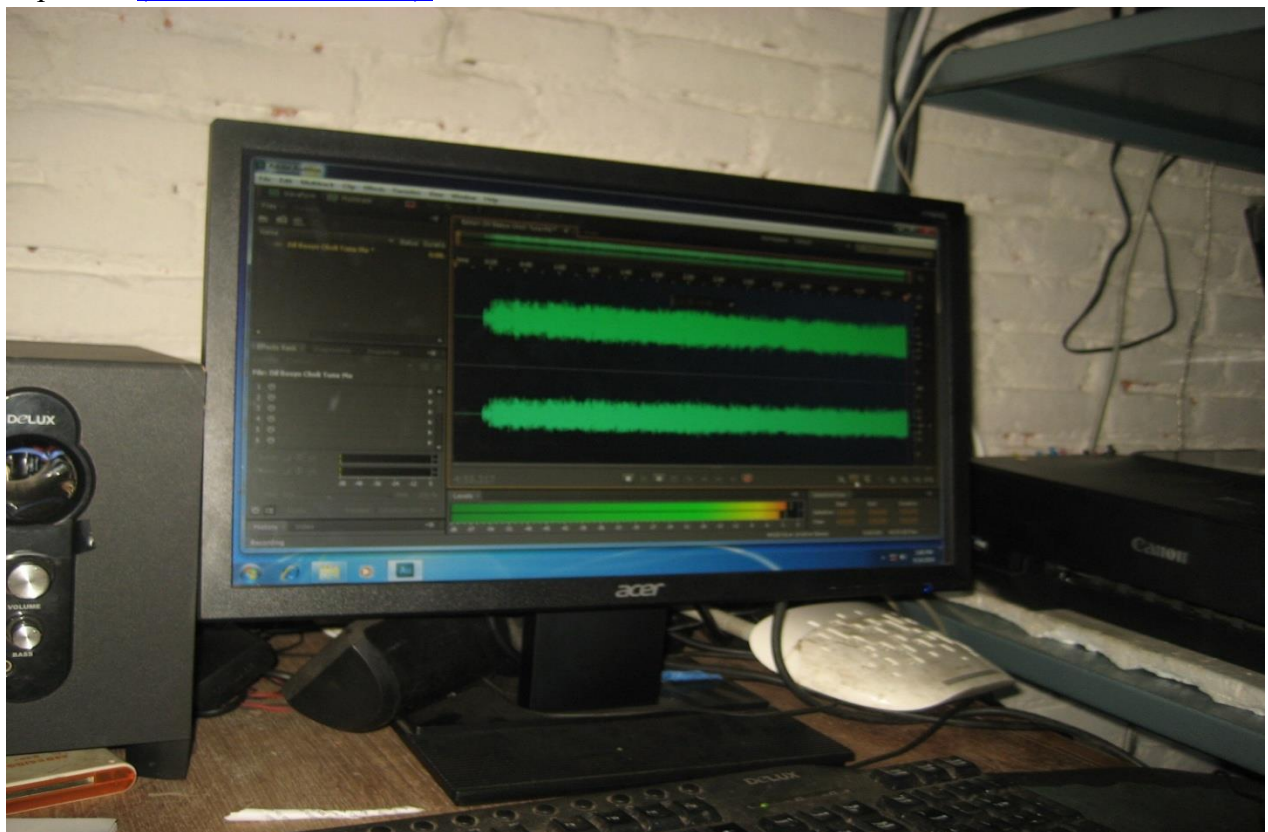


Figure. 1. [An encoded format of an analog audio signal in Adobe Audition, 2014](#)

As the analog signal is converted to a stair step wave, its analog value is now converted to a code known as quantization. Each sampled value in the analog is a binary code, which is the digital format. The more the bits used to transfer a sampled value to a binary code, the more accurate is the binary representation. International Association of Sound and Audiovisual Archives(IASA) recommends a bit depth of at least 24 bits, which is $2^{24} = 16,777,217$ amplitude values.

Digitization Case Studies

i) Endangered Archives Programme 736 (EAP736)

This was the first archiving project the museum did with the assistance of British Library. Delegates of the British library on visiting the museum found the library of the museum in vulnerable condition, where the materials were stored on open shelves with no temperature balance and air conditioning. The museum itself was struggling with the building where the materials were stored, as it was very old unsafe to stay. There was no major source of income for the museum through which it could 'store them under international conditions' or archive. The visitors felt an immediate need of providing assistance, and the project was developed. The project started in the month of August in 2014, then it run over a year. About 250 audio cassettes and 250 mini DVs were archived and a final report was submitted to the British Library. Mrs. Sibongile Pradhan was the project head. The total budget was £25,440. Mr. Babukaji Thapa from Radio Nepal and Mr. Anil Bista from Nepal television trained the technicians of the museum about proper handling and chemical treatments of the materials before archive. Mr. Homenath Bhandari and Mr. Bijaya Pariyar from the museum work with technical portion and Mrs. Paramita Kadel for filling the Listing Spreadsheet as per as the British Library standards. The audio cassettes were captured using Tascam 122 mkiii cassette deck and M-audio Profire 610 Audio interface. The mini dvs were captured using DV replay deck – DSR11. The encoded digital signals were recorded using Adobe Audition and Adobe Premiere software.



Figure. 2. [Technicians of the museum taking trainings on proper handling of magnetic tapes, 2014.](#)

The project was completed on time. The library on thoroughly inspecting the report found the hardworking of the projects members in making the digitization work as better as possible. The digitization work was the first of its kind in the country which could meet the international standards. Various researchers, ethnomusicologists and culturists viewed the digitization works

with keen interest. The archived work is now stored in acid proof boxes with proper air conditioning and temperature. Students and ethnomusicologists have been constantly visiting the museum to access the archived work. The museum is providing free of cost service to anyone to access the archived materials to researchers who have interest in Nepali Folk Music.



Figure. 3. [Tascam 122 mkiii cassette deck, M-audio Profire 610 Audio interface, and DV replay deck – DSR11 in the background, 2014.](#)

ii) National Theatre Archiving Project (NTAP)

The then GM of National Theatre on visiting the museum and viewing the archived work of the museum in 2015, realized the importance of digitally archiving analog materials. National Theatre was established in early 1960s as a cultural institution for helping growing artists to perform songs, drama and dances. The theatre had a large collection of audio video materials of cultural performances and programmers yet to be digitized. The GM had keen interest in archiving the materials and constantly started to negotiate with the Music Museum for assisting in archival work. The museum was highly positive for such work with these 42 reels to reel tapes.



Figure.4. [Ampex 641 LP \(long play\) tape from National Theatre containing a drama named "Shiva Parvati", 2015.](#)

The reel tapes were at first cleaned and chemically treated. However, the reel to reel player of the museum has technical issue. Despite multiple attempts, the reel to reel player could not be repaired. The Museum sought help of Reema Recording Studio for the machine. The tapes were played at the recording studio and thus captured raw digital audio files were again brought to the museum. Technicians of the museum thoroughly examined the audio files for proper noise reduction and quality maintenance. Some changes were made to the audio files and they were finally prepared for archival and storage. The archiving was made as per as the British library standards.



Figure.5. [One of the technicians of the museum working with revox pr99 reel to reel machine,2015.](#)

iii)Intangible Cultural Heritage(ICH) Archiving Program

About 500 hours of analog audio video materials were digitized in the year 2016, which was funded by UNESCO. Tascam 122 mkiii was used as cassette deck for playing the audio cassettes, and the analog signal was then passed to MI AUDIO interface. Digital signals from MI audio were then passed to the computer, they were trapped and recorded through adobe audition. The main technical problem encountered during the project was felt during playing of cassettes due to piling of dust and moulds over the tapes. A large number of cassettes stuck in the cassette deck. The cassettes were cleaned and chemically treated. Another common problem was overheating of the cassette deck and it has to be repaired multiple times. Mini dvs were captured using DV replay deck – DSR11. They were recorded using Adobe Audition and Adobe Premiere software.

Discussion

The research paper on discussion emphasizes the complexity of digitization of analog materials, especially including cultural assets. The initiatives taken by Music Museum of Nepal reveals the museum has keen interest in digitizing and archiving the invaluable materials it has collected and stored over years. In the above mentioned three projects, 250 audio cassettes and 250 mini DVs were digitized and archived from the first project, 42 reels were digitized and archived from the second project whereas another 500 hrs of audio-visual materials, in the form of audio cassettes and mini DVs, were digitized and archived from the third project. The main equipments used to trap audio cassettes were Tascam 122 mkiii cassette deck and M -audio Profire 610 Audio interface with their accessories(wires) to connect them to the computer system. Similarly, in order to capture mini DVs, DV replay deck – DSR11 with its accessories was used. On the other hand, Revox pr99 machine was used to convert reels to digital audio format. The digitized audio files were in .wav format with a sampling rate of 44.1KHz., bit rate 2304kbps and bit depth 16-bit. On the other hand, the digitized video files were in 3:2 aspect ratio with bit depth 24-bit. The information about the audio and video file was filled in an excel sheet with details including accession number, collection title, contributors, artists, instruments, recorded date, recorded country, culture associated and other technical details which are enough to explain the audio or video file. After the archival and digitization work, the analog cassettes, reels and mini DVs were stored in racks and shelves with essential temperature, humidity and dust free environment. Since, an even better way of digitization can be discovered in the future, the museum always holds those materials with proper care and condition. The required information about the digitized material is provided to the students and researchers upon request. On the other hand, the museum is planning to make available online the related information soon. Anyone interested in folk culture or culture heritage of the country can visit the museum and its library.

Long term preservation and use of data

Digital heritage stored at the museum is vulnerable to be lost unless special techniques and policies are designed for its conservation. Some of the principles established by popular libraries for the preservation of digital heritage/collection include integration of curatorial assessment into preservation decisions, preservation of metadata of digital collection, preserving the provenance of digital heritage content, consistent application and documentation of metadata ([Pennock et al., 2018](#)). As the data is created or archived, two new courses, one is its long term preservation and the next is its use for an indefinite period then [Beagrie et al. \(1998\)](#). The data can now be used to fulfill the primary goal, involvement of subsequent secondary examination and fulfill the aim of the researchers who were uncourageously waiting for its archival. The major concerns in data use are copyright issues which the primary data creator or repository (digital library) decides ([Khan, 2022](#)). In some cases where the government is a part of collector, the use and copyright issues are supervised under country's law for national assets ([Wagner et al., 2023](#)).

Threats and challenges

The digital transformation of analog materials pose some unique challenges. The transition from traditional preservation methods of cultural heritages to digital repositories, issues like reliability, data integrity, interoperability and sustainability are often encountered ([Nachreiner, 2009](#)). Rapid growth and sophistication of technologies in one hand brings newer ways of digitization and archiving, where as the older technologies used for the same are either outdated or unusable. Similarly, ease of replication of digital asset poses risks on ownership and copyright especially for sacred and sensitive cultural issues ([Lombardo, 2016](#)). Thus, safeguarding these intangible cultural heritages for future ones is only possible through sophisticated but trustable digitization techniques, advanced data management strategies, and mutual collaboration between the cultural communities, government and collection holders (library) ([Bakshi, 2016](#)). On the other hand, in an era of climate change and harsh environmental conditions, protecting cultural asset against them is an important issue. Extreme weather, fluctuation in temperature and natural disasters pose threat to cultural heritages. Thus, safeguarding intangible cultural heritages must go along with addressing environmental issues. Data need to be stored in physically sound buildings and stores, and has to be migrated to safer stores in case of emergency. Though the world has not seen nuclear war or such nightmares, but we must be prepared to protect data even in such situations ([Stavrakis et al., 2012](#)).

Conclusion and Recommendation

The literature mentioned the digitization and archival of Nepali intangible cultural heritages. The digitization and archival work was first in the country which could meet British Library standards. The literature mentions the background of the museum and its analog repository, beginning of the digitization work, funding for the work, involvements of staffs and experts, technical issues encountered during digitization, digitization process, archival of both original

asset and digital heritage, long term preservation and finally the use of data. The process adapted by the museum is useful for practitioners who hold yet to be archived cultural data.

Recommendation

As archiving and digitizing analog materials is a complex work, the author on thorough investigation of underwent projects of the museum and studying similar research papers and literary works, proposed a few important guidelines for practitioners to overcome both technical and strategic barriers. Some of the guidelines for the practitioners who need their cultural asset to be digitized are

- i) Identify the number of items(books, photographs, reels etc) that can be archived in the allotted time.
- ii) Organize financial security or a strong financial aid.
- iii) Collaborate with experts for proper trainings, cleansing and handling of raw sources of data.
- iv) Define standard format for analog to digital conversion.
- v) Have proper knowledge on domains of the cultural assets([UNESCO, 2003](#)).
- vi) Perform digitization and archival works as per international standards.
- vii) Have knowledge on long term storage of the metadata and original asset.
- viii) Investigate data security and copyright issues.
- ix) Be concerned about long term preservation and use of data.
- x) Identify threats and challenges for safeguarding intangible cultural heritages.

In addition to above mentioned methods for digitization and preservation of intangible cultural heritages, practitioners can cooperate other emerging technologies like Artificial Intelligence(AI) and Augmented Reality(AR) in collaboration with researchers and cyber security experts. Whatever the procedures are adapted, the utmost priority must be given to safeguard cultural heritages for younger generation([Alivizato, 2019](#)).

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