

## Use of Audio-Visual Media Embedded in OER Available in Indian National Repositories from 2017-2022: An Evaluative Study

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### Abstract

Online education is advancing to the top due to the rapid changes in periods and technology. Audio-visual media OER attracts learners and aligns with modern preferences. This study aims to examine audio-visual OER from National Repositories in India, explore utilization patterns, and analyze common OER formats. Data was collected from five national repositories- the National Repository of Open Educational Resources, the National Council of Educational Research and Training, the National Digital Library of India, e-PGPathshala, and Swayam Prabha in India. A total of 125 videos were randomly selected, and 25 audio files from the period 2017-2022 were exclusively downloaded from NDLI. Findings revealed a significant collection of audio-visual OER with various formats. The duration of the videos mostly ranges from 1 to 14 minutes. The predominant video codec was “vp09.00.51.08.01.01.01.01.00 (244),” while the prevalent audio codec was “opus (251).” The popular video frame size observed was “600\*480” and the common video extension used was “avc1.” The analysis of audio files indicates that the most common audio format is “MP2/3,” the codec used is “PCM,” the bit rate is “128.0 Kbits/sec,” the duration ranges from 1 to 4 minutes, and the file size varies from 1 to 5 MB. The study is limited to selected repositories and sample size, which may limit the generalizability of the findings. Despite these, the findings are valuable. Further research is required to explore more about OER and their applications in India.

**Keywords:** E-resources, Open Access, Online Education, YouTube, Multimedia OER formats

**1. Introduction:** Open Educational Resources (OER) are openly accessible to all without any cost barrier and have the ability to change the paradigm of teaching learning activity. To share knowledge and collaborate on problems relating to the creation and utilization of open educational resource, UNESCO established a worldwide OER Community wiki in 2005, according to Prince George’s Community College Library (2023). The National Knowledge Commission (NKC) has recommended increasing the quantity of OERs to meet

up the evolving tendencies (NKC, 2008). Many national repositories like NROER, NCERT, and many more are also aiding the interested people by providing numerous openly licensed materials that impact their research output. In order to increase the support access to knowledge OER come with different forms such as audios, videos, texts, course materials and many other techniques, tools, and other materials. For the purpose of qualitative learning in the quantitative way OER play a pivotal role in raising the level of the education system.

OER is publicly accessible that can also be repurposed, edited, remixed, and redistributed due to a creative commons license. In the methods of teaching-learning, audio-visual-based OER may attract many learners. With interactive audio-visual multimedia materials, OER improves the quality of presentation of the education system. As multimedia-based OERs are engaging and intrusive enough, learners are likely to develop a positive attitude towards technical, vocational education, and life-long learning.

Open Access arose as a response to the limited accessibility of knowledge in academic and scientific journals, which was enforced by commercial publishing companies through subscription fees, licensing fees, or pay-per-view charges (Christian, 2008). Academic information, including articles and data, providing free and open online access to academic information, is the goal of an "open access." For example, according to Open Access Netherlands (n.d.), a publication is considered as "open access" if there are no financial, legal, or technical barriers preventing anyone from reading, downloading, copying, disseminating, printing, searching for and searching within the information, using it in education, or using it in any other way that complies with the legal agreements. Digital repositories are one of the initiatives that educational institutions are adopting to make academic resources freely available to all (Esh & Ghosh, 2021). For instance, Shodhganga, an initiative of INFLIBNET, facilitates the collection of theses and dissertations submitted to universities in India.

Repositories have become the foundation of the modern educational system. This study highlights five national repositories in India that have disseminated numerous educational materials to enlighten the educational society. The National Repository of Open Educational Resources (NROER) was established by CIET, NCERT for school education, in collaboration with the Department of School Education and Literacy, Ministry of Human Resource Development, Government of India (National Repository of Open Educational Resources, 2023). For primary, secondary and senior secondary classes, NROER maintains

a wide quantity of educational resources in many subjects and in several Indian languages. National Digital Library of India (NDLI) is a virtual library of educational materials, generally developed, run and maintained by the Indian Institute of Technology, Kharagpur (National Digital Library of India, 2023). It offers a variety of services in addition to being a library with a search function. It falls under the purview of the Indian Ministry of Education's National Mission on Education through Information and Communication Technology (NMEICT). The goal is to gather metadata from several national and international digital libraries as well as other pertinent sources, offers a full text index, and collects the metadata into one place. The National Council of Educational Research and Training (NCERT) is a self-governing agency of the Indian government, established in 1961 (NCERT, 2023). According to the Societies Registration Act, NCERT qualifies as a literary, scientific, and benevolent society (Societies Registration Act, 1860, 2023). Through workshops and attachment programs, NCERT has been providing training facilities to educate people from different nations. The council produces textbooks for disciplines taught in grades I through XII. In India's government and private schools that employ the CBSE curriculum, NCERT publishes books and offers practice exam questions. The MHRD has launched a project called e-PGPathshala that offers high-quality, curriculum-based interactive e-content in 70 courses from all academic fields, including the social sciences, the humanities, the visual arts, mathematics, natural sciences, and languages (Das et al., 2018). Swayam Prabha is a project of the ministry of education that aims to supply numerous top-notch educational channels via DTH on a round-the-clock basis to the entire nation. The channels are uplinked from BISAG, Gandhinagar. NPTEL, IITS, UGC, CEC, IGNOU, NCERT, and NIOS are among the sources of the information. The website portal is kept up by the INFLIBNET Center. The DTH Channels primarily focus on secondary and higher education, as well as curriculum-based courses and support students (SWAYAM PRABHA, n.d.). This study tries to focus audio-visual educational resources from the specific periods from 2017 to 2022 in selected Indian National Repositories. By analyzing repository perspectives, utilization patterns, and common multimedia formats, this study aims to produce valuable outcomes for academics and content creators by the technical quality and accessibility of educational resources.

**1.1 Objectives of the Study:** This study sets out to achieve three main objectives, uncovering specific aspects of audio-visual, multimedia-based learning materials. The objectives are as follow;

- To explore national repositories perspectives towards the audio-visual OER.
- To examine the patterns of utilization of audio-visual OER.
- To analyze the common formats used in audio-visual OER in national repositories of India.

**2. Literature Review:** With the advancement of online education the necessity of interactive audio-visual OER started taking the floor of the education system. Based on the work done on audio-visual OER, this section reviewed some related literature. Admiraal (2022) presented a view of educators from various educational sectors in order to understand their attitudes on OER and the difficulties and effects of implementing OER. The study revealed that that very few teachers really create, publish, or add OER; rather, most teachers adapt OER to suit their own requirements. Consequently, a typology of OER users, comprising five distinct subgroups, was developed. Baas et al. (2019) indicated that the 'OER Adoption Pyramid' does not properly describe the sequence of each layer within the context of this study. Availability must be lower in the pyramid as a prerequisite for teachers to explore their capacity and volition. Hence, the findings underline the need for support on subject-specific overviews of OER and the creation of national or institutional teacher communities. Bhattacharya (2022) made an effort to ascertain the current state of open educational resources in the field of education that are available in the MHRD online learning repositories in terms of their content type, quantity, topic, language, etc. According to the goals, the researcher discovered seven online learning repositories and discovered that, among many digital learning sources, NDLI has a significant collection of OERs in the field of education. Choi (2020) studied multimedia-based instruction with Open Educational Resources (OER) for elementary school children, considering learning preferences and English proficiency levels. The study didn't conclusively prove OER's effectiveness in English teaching, but in-depth interviews revealed positive student engagement and enthusiasm for the new teaching approach. Clinton (2019) conducted a narrative review of OER in psychology to aid educators in informed material choices. The Cost, Outcomes, Usage, and Perceptions framework was used to arrange the topics in this review. According to the findings, adopting OER resulted in cost reductions while generally producing equivalent or superior academic results. Johnston et al. (2021) described open educational resources (OER) in online classrooms, aiming for relevance and equity. The project shaped the community's understanding of how to instruct in an online learning environment

utilizing OER through interactive discussions between higher education practitioners as part of an action research methodology. Six exemplary learning opportunities emerged, offering valuable insights for blended pedagogy. Park & Mcleod (2018) examined the impact of Multimedia Open Resources for Education (MORE) on arithmetic performance and motivation in high school students with learning difficulties. The findings revealed that there were no appreciable differences in the accomplishment test scores between the experimental group and the control group. We can explore many more studies regarding OER and Online Education systems (Roy et al. 2022; Stracke et al., 2019). However, there is a lack of comprehensive evaluations regarding the common formats and utilization patterns of audio-visual multimedia OER in Indian national repositories. Hence, this study aims to fill this gap by conducting an evaluative study, which will provide important information.

**3. Methodology:** This paper deployed a descriptive research method. Data was collected on 9<sup>th</sup> September 2023 by visiting the official websites of five Indian National Repositories (Table 1): National Repository of Open Educational Resources (NROER), National Council of Educational Research & Training (NCERT), National Digital Library of India (NDLI), ePGPathshala, and Swayam Prabha.

A total of 125 videos were randomly selected, with 25 videos drawn from each repository. In addition, 25 audio files were downloaded only from NDLI to get the desired information. Notably, most of the video links on the websites of those repositories were redirected to YouTube.

Data regarding video titles, durations, frame rates, codecs, bit rate (for audio), and extensions were collected too. The data analysis of this study is primarily based on frequency counts of various analogue/digital formats, and the findings are visualized using Spreadsheets. Furthermore, for grouping the disciplines and subjects, sunburst chart is made for visualization.

Table 1- Selected National Repositories

Sl. No.	Name	Link
1	National Repository of Open Educational Resources (NROER)	<a href="http://nroer.gov.in/">http://nroer.gov.in/</a>

2	National Council of Educational Research and Training (NCERT)	<a href="https://ncert.nic.in/">https://ncert.nic.in/</a>
3	National Digital Library of India (NDLI)	<a href="https://ndl.iitkgp.ac.in">https://ndl.iitkgp.ac.in</a>
4	e-PGPathshala	<a href="https://epgp.inflibnet.ac.in/">https://epgp.inflibnet.ac.in/</a>
5	Swayam Prabha	<a href="https://www.swayamprabha.gov.in">https://www.swayamprabha.gov.in</a>

#### 4. Findings of the Study

**4.1 Analysis of Subjects:** This study found different subjects in their respective broader categories (Figure 1), which encompass Language and Literature, Business and Management, Applied Sciences, Fine Arts, Sciences, and Social Sciences. Subjects like English Literature, Hindi Literature, and Folk Literature were identified under Language and Literature. Business and Management comprise Commerce and Management, while Electrical Engineering, Computer Science, and Medical Sciences fall under Applied Sciences. Fine Arts embrace three domains. Sciences include Biochemistry, Chemistry, Physics, Mathematics, and more. Social Sciences related subjects were Anthropology, Economics, Geography, Library and Information Science, Law, and others, as illustrated in Figure.1. These subject categories give a clear understanding of the different subjects' availability in the repositories.

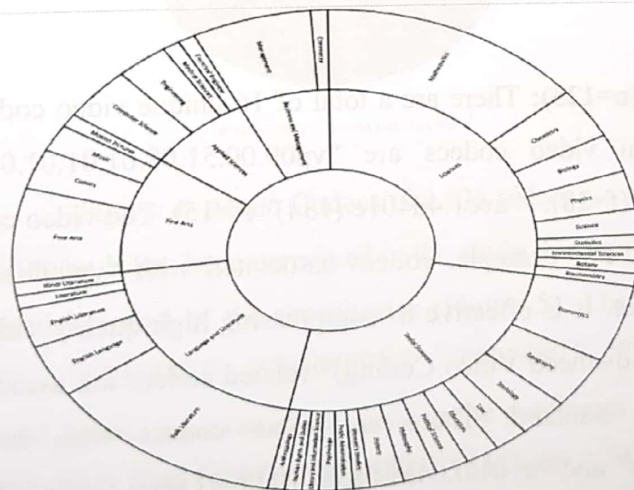


Figure 1- Subjects are randomly chosen for this study

**4.2 Duration of Videos:** In this study, an important pattern emerged: videos with short duration ( $f=47$ , 1-14 minutes) are more in numbers than videos with long duration, followed by a duration of 14-28 minutes, which includes 40 videos (Figure 2). Hence it can be said that these two duration categories provide the highest retention rate with targeted users. It was found that the duration of some videos was in the range between 28-42 minutes ( $f=17$ ). On the other hand, longer videos ( $f= 21$ , 42-84 minutes) are comparatively rare. This shows an explicit understanding of videos in a shorter duration, which further reveals the preference for making short videos. Comprehending this result is a significant aspect of content creation, enabling video makers or content creators to set video duration for better usage.

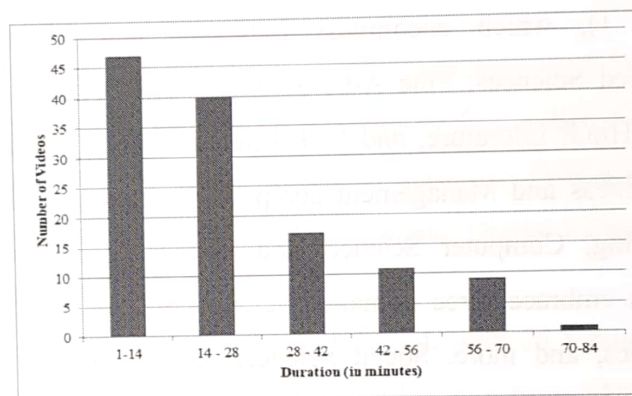


Figure 2- Duration of Videos

**4.3 Video Codecs (n=125):** There are a total of 16 unique video codecs found (Figure 3). The most common video codecs are “vp09.00.51.08.01.01.01.01.00 (244) ( $f=36$ ),” “avc1.4d401e (135) ( $f=28$ ),” “avc1.4d401e (134)” ( $f=15$ ). The video codecs can be grouped into two categories. For example, codecs associated with “vp09” seem to confine VP9 variation video codec. It is effective in compressing high-quality video resources. On the other hand, “avc1(Advanced Video Coding)” related codecs are associated with the H.264 video compression standard. There are some codecs with low frequencies e.g., “avc1.4d400d (133),” and “av01.0.04M.08.0.110.06.01.06.0 (397),” This study found two videos labelled as “NA” that lacked adequate information.

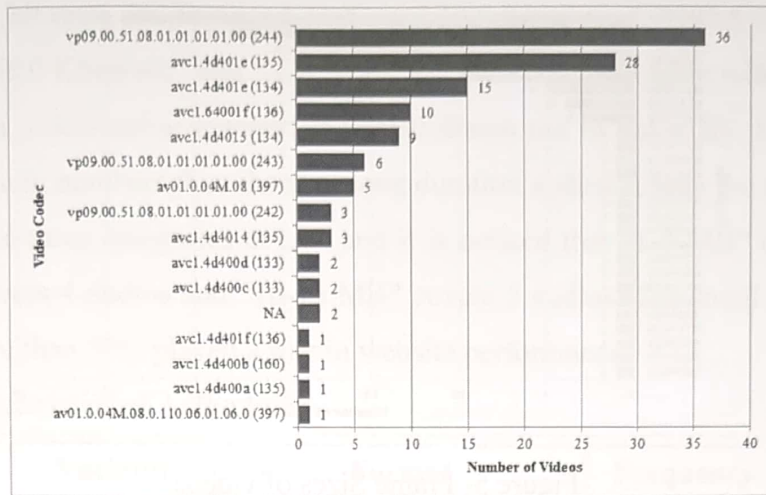


Figure 3- Video Codecs

**4.4 Audio Codecs of Videos:** There are two unique audio codecs of videos found in this study (Figure 4). The most common audio codecs are “opus (251)” and “mp4a.40.2(140).” Here in the study it is noticeable that opus codec is 88% and “mp4a 40.2 (140)” codec is only 12%. Meanwhile, the study has shown that “Opus (251)” mostly used audio codecs in video-based OER effectively by compressing big video files and enhancing the quality of files at all bitrates.

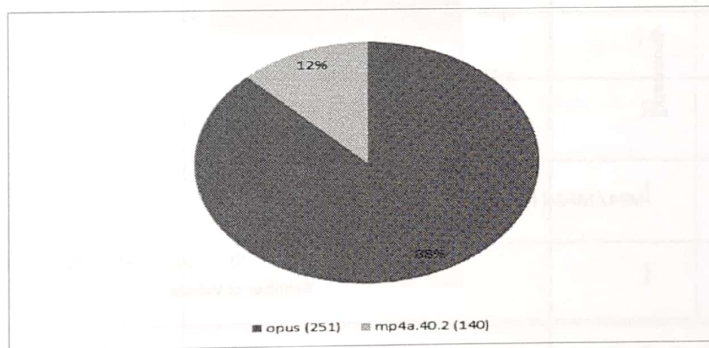


Figure 4- Audio Codecs (for 125 videos)

**4.5 Frame Size of Videos:** It has been perceived in the study that there are enormous frame sizes that are preferred by most of the repositories (Figure 5). The most common frame sizes are “600\*480,” “853\*480,” “1050\*591,” “640\*480,” “729\*410,” “654\*480,” “811\*456,” “1067\*600,” these are extensively used in the maximum number of videos and others such as “268\*482,” “565\*428,” “588\*480,” “637\*480,” “656\*480,” “729\*375,” “800\*600,” “834\*480” and “937\*527” are comparatively less used. It has been seen that the frame size i.e. “600\*480” mostly preferred frame size used by the video-based OER.



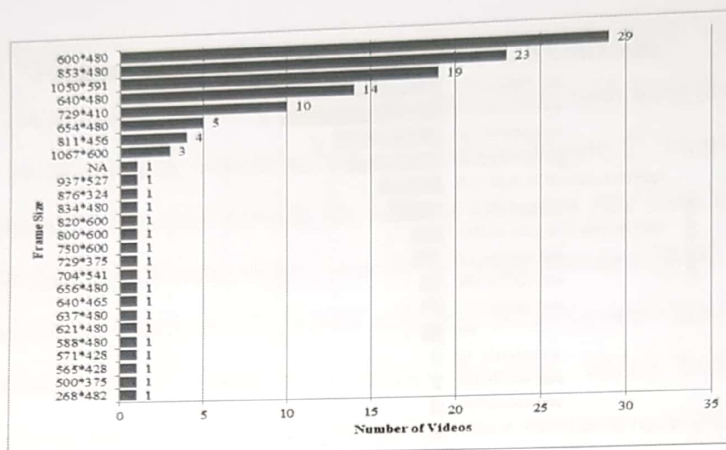


Figure 5- Frame Sizes of videos

**4.6 Extension of Videos:** This study has shown the various extensions of videos (Figure 6) used by the resources such as “avc1,” “vp09,” “av01” and “Mp4/ MPG4.” Among these different extensions it has been perceived that the preferred extension is “avc1” then come “vp09,” “av01,” and “mp4/mpg4” respectively and two video extensions labelled as “NA” by the study that showed insufficient information about two video files.

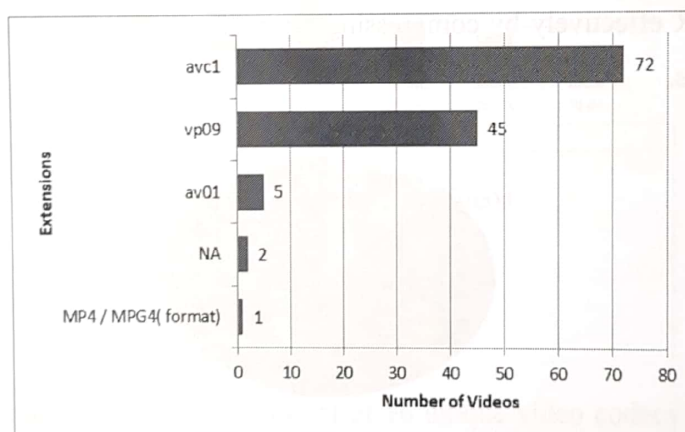


Figure 6- Video extensions

**4.7 Analysis of Audio (n=25):** In this study 25 audios are selected randomly from the NDLI website (Table 2). Here various variables are discussed with their formats and frequencies. Two particular audio formats “MP2/3(MPEG audio layer 2/3)” and “WAV/WAVE (Waveform Audio)” are identified from the data gathered for the study. The frequencies for the said audio formats are 17 and 8 respectively. Moreover, two mostly common audio codecs such as “MP3 (MPEG audio layer 3)” and “PCM signed 16-bit little endian” are identified with the same frequencies 17 and 8 respectively. ‘Bit Rate’ is the prime factor of audios that gives impact on size and quality of audios. In this study many

different audio bit rates are discussed such as “128.0 Kbits/sec,” “705.6 Kbits/sec,” “192.0 Kbits/sec,” “256.0 Kbits/sec” and “320 Kbits/sec,” shown in the table with frequencies that are arranged in a decreasing manner. It is also drawn out in the study that short duration audios are more in numbers than those of long duration audios. Lastly the size of the audios are explained in three categories of size and it is noticed that “1-5 MB” covers 16 audios, “5-10 MB” covers 4 audios and “10-15 MB” covers 5 audios. The small sized audios that are almost more than 50% played a role in website performance.

Table 2- Characteristics of Audio Files

Variable	Format	Frequency
Format	MP2/3(MPEG audio layer 2/3)	17
	WAV/WAVE (Waveform Audio)	8
Codec	MP3( MPEG audio layer 3)	17
	PCM signed 16-bit little endian	8
Bit Rate	128.0 Kbits/sec	14
	705.6 Kbits/sec	8
	192.0 Kbits/sec	1
	256.0 Kbits/sec	1
	320 Kbits/sec	1
Duration	1-4 mints	23
	4-8 mints	2
Size	1-5 MB	16
	5-10 MB	4
	10-15 MB	5

**5. Implications and Conclusion:** Observing the audio-visual OER in this study, it can be said that there are numerous practical and social implications of audio-visual OER. From a practical perspective, educators and content creators can customize learning resources and promote access to different types of learners. Standardized and well-organized OER formats enable mass accessibility and help learners for sharing their knowledge widely. In addition, familiarity with multi-media OER formats may enhance in media literacy. From a social perspective, the variety of OER may boost learning system and allow educational institutions to meet the needs of their community.

This study promotes enhanced communication between educators, teachers, and students. Sharing audio-visual resources enables everyone to expand their knowledge and skill sets. The repositories encourage paperless and digital learning, which are environmentally friendly. Utilizing this technology available in the repositories not only connects students and teachers, but also enhances the educational process by adding effective value. This study has limitations. It is based on selected repositories and small sample size, which may limit the generalizability of the findings. Despite these, findings obtained from this study are valuable. This study offers unique outcomes on the characteristics and trends observed in audio-visual Open Educational Resources in five national repositories. Future research could be executed by taking more repositories and sample size for deeper comprehension. Researchers can explore innovative educational strategies integrated with OER.

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