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Design and Application of Media Asset Management System in University

Xintian Bu (First author)

Learning Resource Centre, Zhejiang Open University

Hangzhou, China

Tel: 86-0571-89983068 E-mail:buxintian@163.com

Yufan Lin (Second author)

Information Centre, Zhejiang Open University

Hangzhou, China

Tel: 0086-17794561560 E-mail: LYF19930811@126.com

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Abstract

Zhejiang Open University is a distance education university supported by information technology, which has accumulated a large number of educational audio, video, and other media materials during years of development. With the development of digital media, it is a new challenge to manage media materials since the media resource is becoming diverse and the file size is becoming large. Following this, the purpose of this study is to build up an effectively comprehensive digital management system to strengthen the intelligent storage and control of important educational materials.

Keywords: media asset management system, educational audio and video management

1. Background

Under the current era of digital media, it is a new challenge for Zhejiang Open University to build up a system for intelligent storage, management and resource reuse since the amount of educational audio and video material is growing exponentially as a format of unstructured data. After a complete investigation, the following difficulties have to be dealt with for effectively managing educational audio and video materials:

1.1 The Storage of the Device is Limited Since the Material Size is Becoming Larger and Larger

With the development of 4k technology, people have growing requirements for immersive experiences using a larger screen. Therefore, Zhejiang Open University currently focuses on building up an ultra-high definition (UHD) system for creating an educational resource with the support of the Smart Education Media Center. This system will bring a completely new visual experience to the learners, while the requirement for the capacity of storage is high. In comparison with the previous standard definition and HD, the most widely used coding technology H.264 will increase the file size during compressing 4k UHD video. The capacity of widely used storage devices such as hard disks will become limited with the growing number of files.

1.2 The Storage Devices are not Unified, Resulting in High-Security Concerns on the Data

In the non-digital era, historical materials including films for university anniversaries and courses were stored in the magnetic and optical storage devices such as tape, CDs, DVDs, etc. While these storage devices not only have high environmental requirements but also have a concise service life. Moreover, long-term storage and multiple uses will increase the risk of losing data. Under the current trend of digitization, mobile and online storage including mobile and network hard disks have become the major way for educational materials storage. However, the mobile hard disk is easy to damage the data due to improper operation. The network hard disk strongly relies on online services from the corresponding company, and it is also easy to damage the data because of network security risks and other potential threats. Meanwhile, the current data storage media is not unified, and the directory mainly relies on manual operation and maintenance. The diversity in the types, formats, and names of resources makes it difficult to share and conduct intelligent queries, which reduces the reuse efficiency of resources and increases difficulties in management, followed by data loss and fault.

2. Strategy

2.1 Create a Muti-channel Audio-video Acquisition System with the Feature of Open-access and Compatible

At present, the audio and video are mainly from educational materials and university events. The venues for recording audio and video are mainly the recording studio, online recording, television studio, and studio hall; The venues for recording university events are mainly the film studio, lecture hall, and outdoor. Different systems and equipment were applied for different recording venues. The newly developed multi-channel audio-video acquisition system is able to support the signal from various systems and formats, upload the records from video tapes with important historical data, support single and multiple acquisition modes, and support to import of different types of digital media documents.

2.2 Build Up a Comprehensive and Dedicated Management System to Integrate Resource

The principles of system design should follow the concept of standardized, reasonable,

efficient, and intelligent. The newly developed system aims to dynamically manage different types of media materials. The management of the public resource is based on the cluster of departments/groups. The newly developed system is able to support multi-collaborative management, integrate resource construction and management into routine work, and provide editors with specific storage space to improve flexibility. In addition, this system is able to create a standardized catalog based on specific requirements and generate the meta-data which is intelligently defined and matches the properties of the resource. The newly developed management system is equipped with monitoring and statistical functions, which is able to monitor the resources, processes, tasks, services, and system hardware at multiple levels. As a result, it is able to quickly create quantitative resource and system operation reports at a statistical level. The newly developed management system is able to stable the necessary management procedure, refined the process, and reduce the randomness caused by human factors toward a direction of standardized and dedicated management.

2.3 Build Up an Open-access Resource Platform for Efficient Sharing

The newly-developed system should overcome the previous three bottlenecks in resource sharing including unavailable, redundant, and inefficient. It is able to use the life span of the raw material to design the retrieval system, and use the external sharing rights to improve the rate of retrieving the resource, finally improving work and resource use efficiency. The retrieval engine should meet the following three requirements(a)visually browsing video and audio; (b)retrieving the entire text from document and meta-data; (c)supporting to retrieve synonyms, homonyms, automatic association, category, location, and voice. The newly-developed system is able to establish an effective link with the OA system, and create a new way for sharing resources such as setting a browsing interface for the external resource (refers to the staff from other universities), downloading the approval process, and managing user accounts. The users can have the right to download different code rate resources through the web or client agent tools according to the specific requirements after being approved by the manager.

2.4 Build Up a Dual-line Linkage Storage Mode with the Aim of Long-term Security

The basic system structure should fully consider the following five elements: network, data, application, operation, and monitoring security. The network construction has high requirements on security, confidentiality, and stability to ensure the effective interception of hacker attacks and prevent the system collapse from virus infection. As a result, the newly developed system is able to real-time monitor the network and equipment operation as well as self-detection and self-correction. The system is able to resume operation in a very short time when the system is down. In terms of data storage system construction, it has a dual-active backup system with the mode of RAID, which has online and offline linkage storage modes. The storage mode can be selected based on the feature of the resource characteristic and update, etc.

3. Project operation

3.1 System Architecture

Based on the overall planning of intelligent education and media center, the integrated system of teaching resources utilize a set of features including collection, compilation, broadcasting, review, and storage in the mode of a 'central kitchen'. The unified scheduling and interconnection among various modules are based on a combination of basic network architecture using Gigabit Ethernet and the campus network. As a crucial part of the 'central kitchen' system, the architecture of the media assets management system is designed from four aspects including technical support, data storage, service, and terminal (the diagram of the system architecture is shown in Figure 1). With the assistance of Gigabit Ethernet, the systems of the recording studio, cloud classroom, television studio, studio hall, mobile director, and non-linear editing machine can be connected with the video-audio download workstation, catalog retrieval workstation as well as the online storage device, which is able to provide a standardized process for resource production and management.

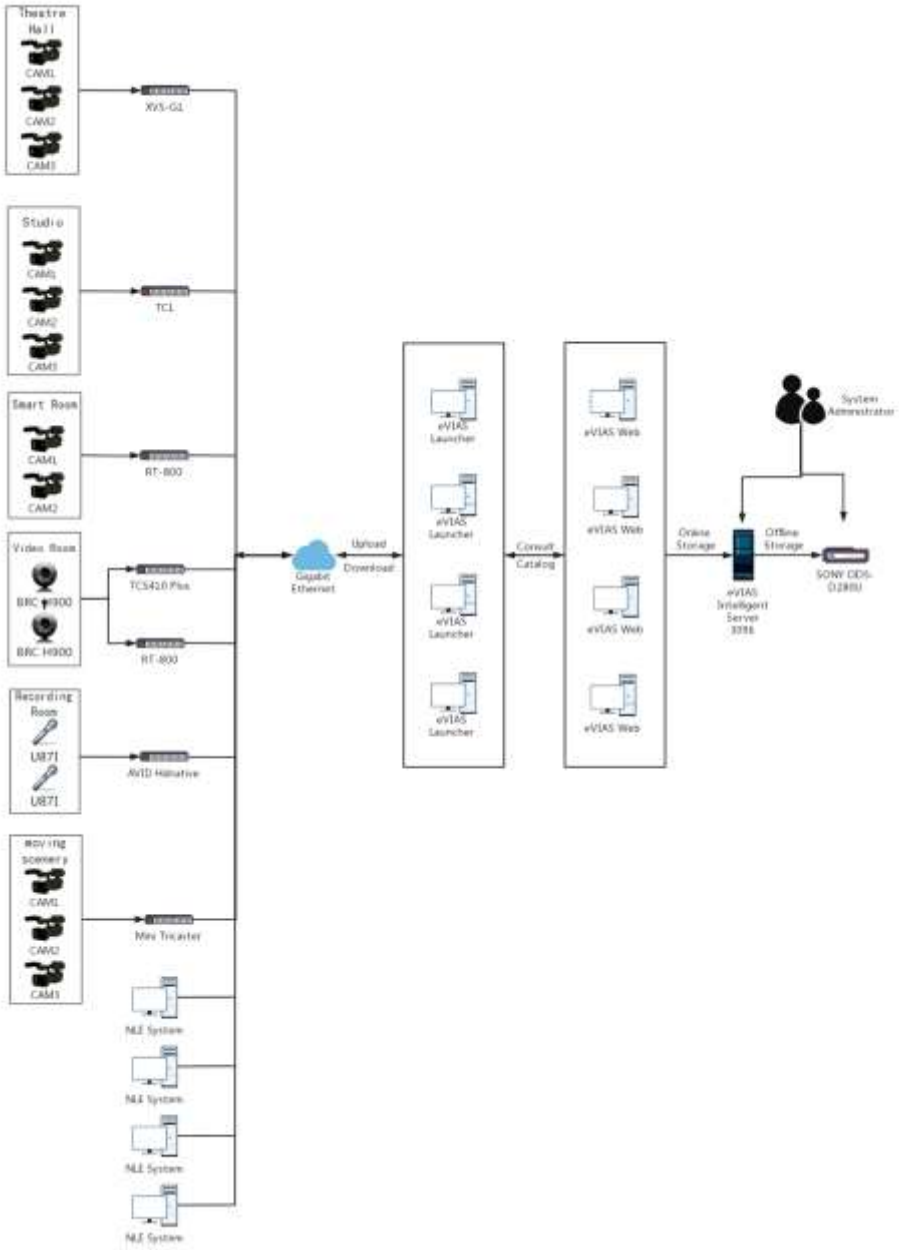

Figure 1. System architecture diagram

3.2 Storage Architecture

The system divides the storage system into online storage and offline storage using hierarchical storage management. The high integration cabinet is used as the online storage equipment with the ocean eVIAS Intelligent Server 3096 intelligent storage management server which can accommodate 6000 hours of video with a storage capacity of up to 96TB. The offline archiving storage device uses SONY Optical Disc Archive as mass CD data storage system, equipped with an ODS-D280U Optical Disc Archive data flow drive and 20 3.3TB ODC-3300R second-generation one-time write disc boxes. The write speed is up to 1 GB/s and the read speed can be 2 GB/s, greatly improving the efficiency for archiving and

migrating. Moreover, the ‘read-only’ mode (data writing is unavailable) for offline storage devices can effectively prevent data loss due to human error or viral infection, ensuring the security of important data.

3.3 Catalog Planning

System cataloging follows the principles of accuracy, standardization, practicability, and operability, as well as the guidance of technical documents published by the National Radio and Television Administration and the Ministry of Education to determine the core elements, structure, and cataloging methods of the cataloging metadata.

Cataloging metadata is considered based on three aspects including basic information, technical features, and other information. The core elements are shown in Table 1. Among them, the basic information and technical features are essential items. For technical features, except for the creator names, some technical features can be automatically generated in the system, and others can be selected according to the specific information. Primary classification and secondary classification can be referred to in the resource classification table of Academic and Non-Academic education at Zhejiang Open University.

Table 1. Table of meta-data

Essential information	Technical Attributes	Other information
Title (Course Name)	Creator name	Primary classification
Resource Type	Creation date	Secondary classification
Keyword	Video code rate	Source
Speaker (main character)	Form	Suitable object
Speaker (main character) unit	Time	Language
Content description		

The multilevel tree cataloging is selected as a cataloging structure since it can record the characteristics and contents of data in detail, and is divided into four levels: program, segment, lens, and keyframe. The program is featured complete and independent theme video materials; the segment refers to the representative and iconic lens in the video; the key frame is a single image that can reflect important information in a video, such as key person frames, representative building frames, special action frames, subtitle frames, ending frames, etc.

The cataloging method can use in four ways including single-layer, layer-by-layer, cross-layer, and mixed layers. Single-layer cataloging refers to the program recording, which applies to all audio-video data. Layer by layer, cross-layer, and mixed layers can be selected according to the specific information. The selection of relevant metadata is more flexible, without a requirement on the basic information and technical features in comparison with program cataloging.

3.4 System Workflow

The technical innovation of the system will promote complete changes in workflow and concept, which is able to break the conventional management mode, and integrate resource construction and management into daily work, realizing the specialization, standardization,

and digitization of resource management.

Based on the requirements of the system workflow, the public resources can be managed according to the department or group, so different permissions are granted to the corresponding department and person. With one department as one unit, the responsibility is classified as the principles of a specific person for undertaking responsibility, warehousing and cataloging, and the administrator for inputting offline data (Figures 2 and 3). When there is data created, the responsible persons log into the workstation for uploading the data to the corresponding folder according to the folder navigation. Then, the system backstage automatically completes trans-coding and generates streaming files for cataloging, retrieving, and browsing. After that, the manager catalogs the data aligned to the requirements of cataloging, and submit it to the data administrator for a double check once completing the online storage. The data administrator (the person who is taking resource warehousing and submitting the files) examines the online storage data and cataloging, as well as selects the data to be archived, and submits the applications for achieving to the library administrator according to the principle of "Measures for warehousing and archiving of learning resources of Zhejiang Open University "within the timeline. At last, the data administrator completes the offline archiving and submits the detailed list of relevant archived data after getting approval from the library administrator. The operation process of resource sharing and reuse can be divided into two classifications according to the different types of resources: one is the calling of the online store data. The system will open the permission for downloading the source rate files and carrying the metadata files to the later editors. The faculty and staff who need to browse and download the data have to submit online applications through the OA system and get approved by the department. If the applicants are in the environment of an external operator network, they can get access to the eVIAS Web by logging into the web VPN. The second one refers to the calling of offline archived data. The application for borrowing the data should be submitted to the corresponding department. After getting approved, the borrowing and return have to be aligned with the process.

Figure 2. Workflow model diagram

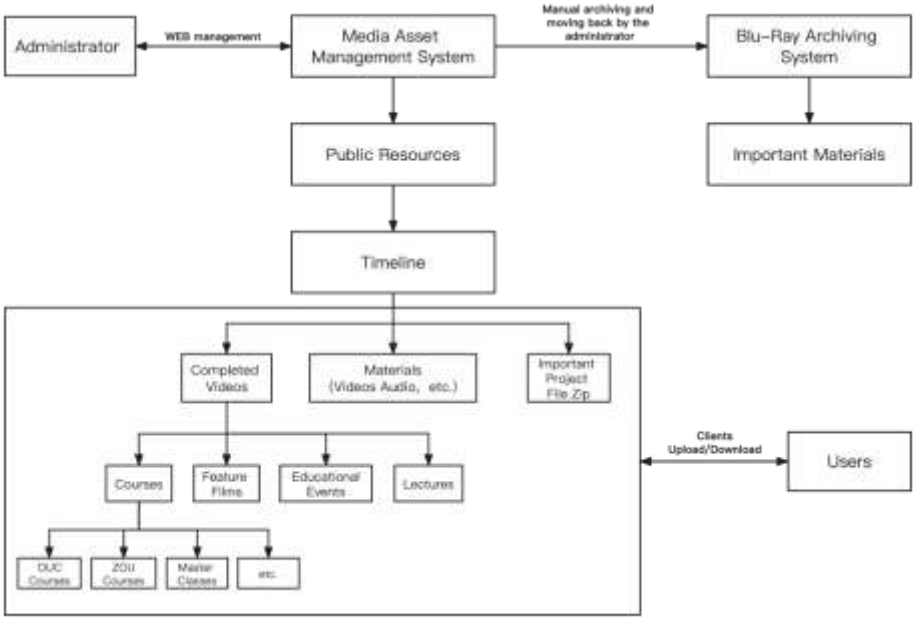

Figure 3. Storage folder structure

4. Exploration and expanding

4.1 Artificial Intelligence Facilitates the Improvement of Efficiency

Artificial intelligence has become a prominent technology to lead the deep integration of modern education and driving media. Making full use of artificial intelligence technology for cataloging will exert a profound impact on the digital management of audio and video data and bring higher value.

Based on the current system structure, an intelligent ‘cataloging team’ can be built up by introducing artificial intelligence speech recognition, face recognition, hot word analysis, hot spots discovery, automatic summary, intelligent label, and automatic generation technology for subject phrases in the later stage, enhancing the systematic, comprehensive, refinement characteristics in resource storage development and management. The proper deployment of this technology in the educational system can improve the efficiency of workflow processing by saving manpower, material resources, time, and other costs. For example, speech recognition can automatically convert the discourse in video and audio into text, locating the precise time-code position of the discourse, and support keyword searches and subtitle file export based on speech recognition contents; face recognition can intelligently analyze and mark critical persons in videos and pictures, and automatically organize them into a Library for key persons. Hot word analysis and hot spot discovery can compare the contents of the materials with the current hot spots and hot words, analyzing and sorting out the high-value content that can be exploited and utilized. Based on the results of intelligent recognition and analysis, automatic summary, and intelligent label, coupled with the automatic generation of topic phrases can identify critical factors such as the time, place, people, events, and other contents within the data. What is more, it can automatically generate personalized tag libraries for searching associated resources based on the labels by combining hot word

analysis for creating abstracts, themes, and tags.

4.2 System Upgrade Facilitates Service Improvement

With the rise of 5G, the whole media era has ushered in a new pattern of media convergence systems. Furthermore, Educational informatization has entered into the stage of intelligent development by promoting the integration and development of traditional media with new media. It has become a topic with further discussion on how to think in the way of User first, Experience best, free business model, disruptive innovation to make use of media assets to support producing educational content, the open servicing for massive learners, the specific historic moments, enriching school campus culture, market operations, as well as expanding the functionality of school (Wong, 2020, pp. 43-45).

Ensuring effective data exchange is the prerequisite to realizing media asset convergence and sharing. Based on meeting the existing needs, the system developer considers the flexible deployment and capability of core equipment, reserves the upgrade interface for hardware equipment, and provides an API interface according to the requirements. It offers a guarantee for service promotion to integrate other systems and applications through building a unified middle ground in terms of technology, data, and users, as well as building the technology support platform which is integrated with service cloud intelligence technology.

4.3 Talent Training Facilitates the System Development and Upgrade

With the development and spread of integration of ‘Internet +’ with media, it is an urgent need to continuously import high-quality educational and technical talents; establish various groups of educational and technical talents; and build a systematic and stable talent system. The talent training progress is classified into the following four sections: the first is to change conventional thinking according to the development requirements. Practitioners need to change and improve their consciousness, including keeping the original concepts, absorbing new concepts from outside, facing the future, and deeply understanding workflow requirements, communication modes, and informationally educational environment in the era of media convergence. The second section is to increase the intensity and breadth of the training and improve the professional quality. The professional quality of personnel in communication technology, computer, new media production, operation knowledge, and other aspects can be improved by broadening the field of training. The third section is to break the conventional way of “junior follow senior” and then establish a new fellowship system which is a flexible school-enterprise joint training system to provide opportunities for new practitioners and senior experts to work side by side on specific projects, and regularly conduct practical training. The fourth section is to train innovative talents through organizing competitions, offering guidance, establishing an assessment system, and building an innovative training platform.

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