ISSN 2616-7433 Vol. 6, Issue 1: 173-179, DOI: 10.25236/FSST.2024.060128

A Management System for Remote Utilization of Student Files Based on Trusted Storage

Ying Li

Xuzhou College of Industrial Technology, Xuzhou, Jiangsu, China
277385504@qq.com

Abstract: *The development of archives digitization makes the remote utilization a trend. The remote utilization of Students' archives can break through the limitation of time and space, so that students can query their own archives information at anytime and anywhere, better play the value of archives. However, the trustworthiness of electronic archives is facing more challenges in the digital environment. The realization of trustworthiness storage provides strong guarantee for the trustworthiness of long-term preservation of electronic archives. Remote utilization system should have perfect security mechanism, including user authentication, data encryption transmission, access control and so on, to ensure the security and stability of remote utilization system data. The purpose of this paper is to discuss the design and use of the remote utilization system of college students' archives under the premise of ensuring the security and authenticity.*

Keywords: *Trusted Storage, Electronic Archives, Remote Access, Data Security*

1. Introduction

Along with the process of archives informationization in colleges and universities, it has brought an opportunity for the highly repetitive work of archives management, which has been applied in the daily work of archives management, such as the construction of digital archives, automatic classification of Archives Information Resources, paper-based archives information construction and automatic filing, electronic certificate retrieval and printing. In the digital era, where the development of digital economy is highly valued, we will continue to promote the deep integration of digital technology and real industry, and accelerate the building of a cyber-power and Digital China. In recent years, the state has been promoting the construction of archives informationization. In 2022, the first-level discipline of “Library and information archives” will be renamed “Information Resources Management”, these changes has put forward the information construction request to the file management work. The remote service has gradually become an indispensable part of all walks of life. Under the circumstances that some provincial and municipal archives departments carry out remote file-searching to bring convenience to users, the ways of using archives in universities should also be explored and innovated, the use of information technology to improve the efficiency of file management, to provide more convenient and efficient services[1]. At present, the remote utilization of archives in colleges and universities is not carried out in step with the construction of archives informationization. It is only to submit applications remotely. After the archives see the applications, they mail the paper materials offline, but they cannot transmit them remotely. A more complete student file management system should include reception registration system, collection management system and file transfer registration system, can better deal with the student archives archiving, utilization, custody, transmission and other aspects of information management needs. At the same time, the remote utilization system should have perfect security mechanism. “The 14th five-year plan for the development of national archives” states to create a scientific credible storage and verification system to ensure the authenticity, integrity, availability and security of electronic archives.

This paper aims to discuss the design and implementation of the remote utilization system of Graduates' archives, and to provide reference for the management of University Archives. The long-distance utilization of students' files is an important embodiment of the development of education informationization. This kind of service mode can not only promote the information level of the school, but also promote the information development of the education industry.

ISSN 2616-7433 Vol. 6, Issue 1: 173-179, DOI: 10.25236/FSST.2024.060128

2. Process Analysis and System Technology Analysis of Student Files Remote Utilization

2.1. Process Analysis of Student Files Remote Utilization System

According to the characteristics of university archives, remote utilization can be divided into three processes: registration, verification and transmission [2]. There are three interfaces in the remote utilization system; namely, remote utilization registration interface, remote utilization management interface and remote utilization sending interface (see Figure 1). The users of the remote utilization system mainly include on-campus staff, on-campus students, off-campus personnel, former alumni; the commonly used archives include college documents, scientific research achievements, graduates' archives, student status archives, capital construction archives, etc. When users have the need to check files, they first log on to the Archives Service Hall, fill in the application information through the online archives remote utilization service system, register the appointment inquiry, and then complete the examination and verification by the professional archives system management personnel, the applicant's information on a multi-level, multi-link strict examination to ensure the authenticity of the file one-on-one, staff to submit their identity cards, graduation cards and other effective information after identification audit, to find the file by the system to add digital watermark and electronic signature sent to the user, if you need paper version of the mail to the system query express information. If the requested files are transferred to other units or departments, the information will be transferred to relevant departments through the system and the results will be returned to the applicant in time to create a one-stop service, open file". The last mile", so that more information running, so that users less running. For example, the school archives can be integrated into the school OA System Archives Data Platform, with the office of receiving and sending documents system, science and Technology Department Scientific Research Management System, educational administration office student status management system data docking, improve the information level of file inquiry and service utilization. The graduates' files can be connected to the local talent centers to provide a clear path for the graduates' files to query, and to link up with the provincial and municipal talent centers' archives searching platforms and the National Archives searching platforms, realize the humanized management of remote sharing.

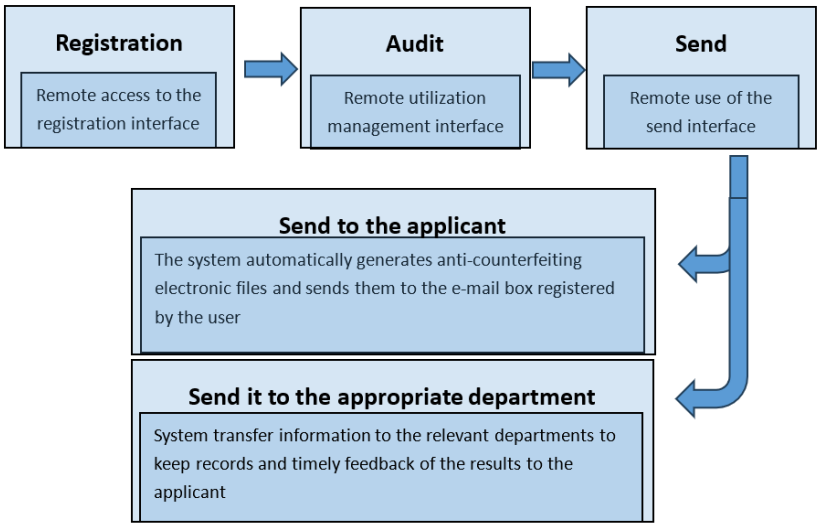

Figure 1: Remote utilization process analysis

2.2. Technical Analysis of Student Files Remote Utilization System

The remote utilization system of student files should adopt B/s architecture (see Figure 2), which is convenient for the user to access through the browser. The full name of the B/S architecture is Browser/Server, or Browser/Server architecture. Browser refers to a Web Browser, with very little transaction logic implemented on the front end, but the main transaction logic is implemented on the server side [3]. The system should include database server, application server and Web server to ensure the stability and security of the system. The layer of B/s architecture: the first layer is the presentation layer, which mainly completes the interaction between the user and the background and the output function of the final query result; the third data layer: the main is to accept the client-side request

ISSN 2616-7433 Vol. 6, Issue 1: 173-179, DOI: 10.25236/FSST.2024.060128

independently of the various operations (see Figure 3).

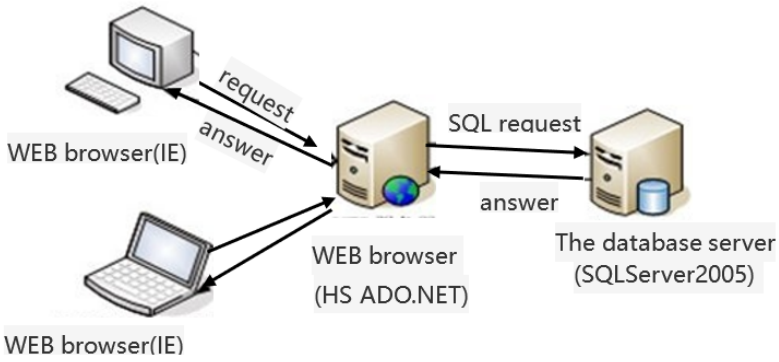

Figure 2: System architecture diagram

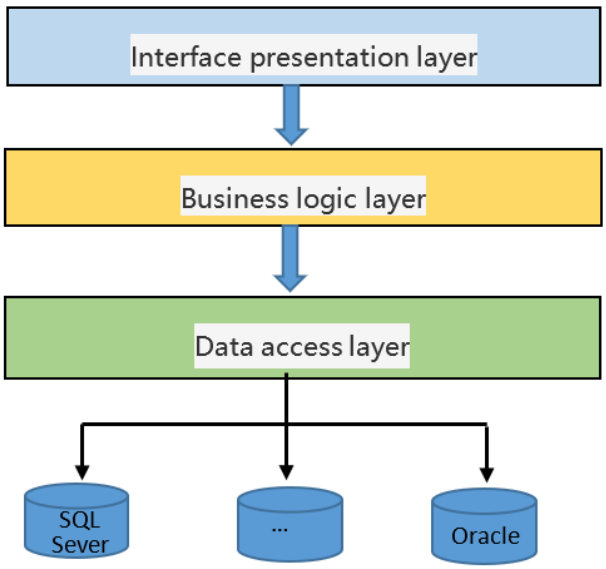

Figure 3: Layering of the B/s architecture

2.2.1. The file network brings convenience and also brings risk

The remote use of electronic files may face the problems of personal information embezzlement and original tampering. While sharing the files remotely, the authenticity of the files is guaranteed, and the electronic files of the original files are protected by digital watermarking, information hiding, reversible information hiding and electronic signature.

2.2.2. Create a database of archival user information

Establish and improve the data management concept and management mechanism of "Speak with data, make decision with data, manage with data, innovate with data". [4]. Set up a database of archival service objects, through the platform to apply for users to provide information and system automatic matching and verification, identity authentication. In order to ensure the accuracy of user information, users are required to provide multi-level information. In addition to the basic name, but also to add ID number, student number, grade, major and even degree certificate number, or provide their own ID photo.

2.2.3. Using digital technology to realize remote sharing of Big Data

Cloud computing technology and digital archives form an archive cluster, and all the information in the cluster will be integrated into the same platform, and on the platform to achieve electronic storage and remote sharing. On the basis of the original digital management of archives, Shaoxing Archives of Zhejiang province has established the "Regional Civil Archives Integrated Management and service platform" and "Regional Public Archives Information Resources Management and service general

ISSN 2616-7433 Vol. 6, Issue 1: 173-179, DOI: 10.25236/FSST.2024.060128

platform", thus realizing the co-construction and sharing of archives resources.

3. The Design of the Student File Remote Utilization System Based on Trusted Storage

By establishing a scientific and reasonable management mechanism, we can ensure that electronic archives are always formed, captured, transmitted, stored and utilized in a safe and controllable environment, and the use of electronic signatures, trusted time stamps, integrity verification, blockchain and other legally recognized technical means to protect the "Four" of electronic records (Figure 4), the realization of electronic archives throughout the life cycle of trusted storage [5]. The system should have a perfect security mechanism, including user authentication, data encryption and transmission, access control, to ensure the security and stability of the system. For example, the Liaocheng University archives has developed a "University archives query and utilization platform"(figure 5), which 2023 a remote reservation for archives retrieval, then the National Archives Query and utilization platform, not only formally included in the regional use of Shandong province archives "A game of chess", but also integrated into the National Archives Query and utilization system. In every step of the process, users can receive instant message alerts, which greatly shorten the communication time, improve the efficiency of the work, to ensure the safety of user information.

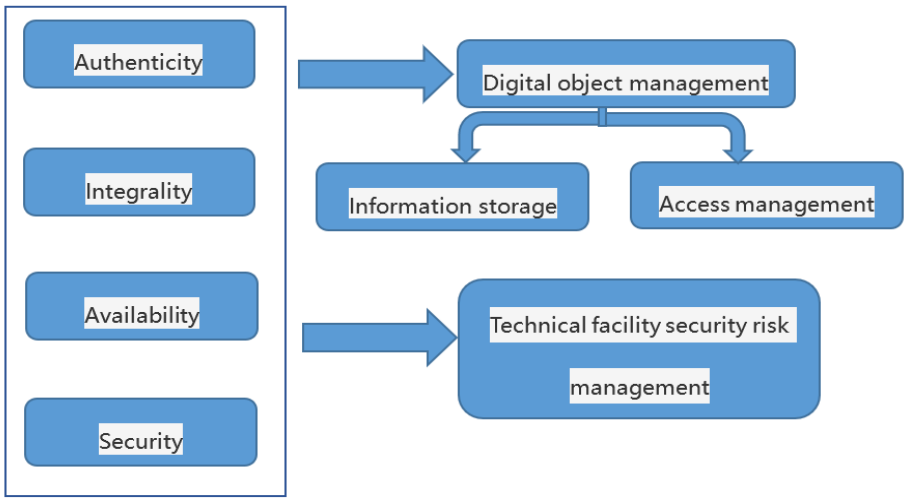

Figure 4: Four-character trusted authentication mapping

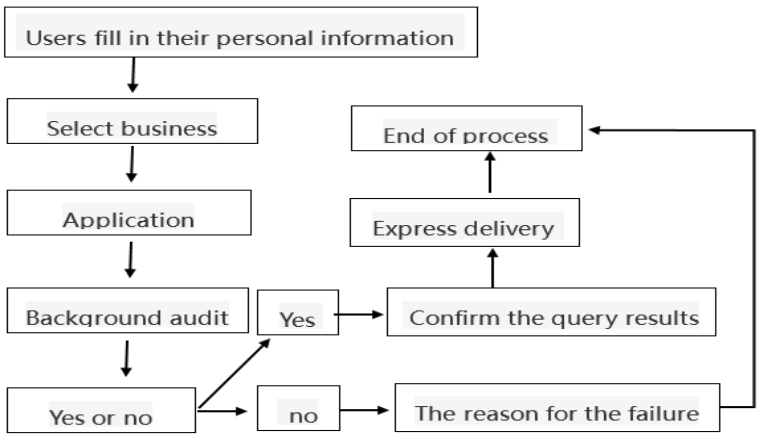

Figure 5: Liao Cheng University remote access system

3.1. How to Make a File Trusted

3.1.1. To strengthen the distributed data storage, point-to-point transmission

Consensus mechanism, encryption algorithm and other new application models of computer technology, which can help build trust between different nodes, the application of the file trusted block

ISSN 2616-7433 Vol. 6, Issue 1: 173-179, DOI: 10.25236/FSST.2024.060128

chain, “Network Card” on the chain once, can not be repeatedly verified, greatly improving the identity of citizens longer validity period and wider scope of application [6]. The traditional way of identity authentication has low security, and is easy to be attacked and hijacked by the outside, and its centralized way of information storage is easy to cause the information to be tampered with, therefore, how to use the block chain technology to strengthen the file trusted identity, authentication security, will be the next research direction. The trusted authentication service is embedded in the self-service file-checking terminal, so that the masses can manually input the ID card number and name when self-service file-checking [7], live verification, face image collection on-site uploading for trusted identity authentication, and finally according to the results of authentication directly self-service or transfer to manual services, optimize the service process of file access.

3.1.2. Strengthening the data management of the remote utilization system

The service of remote utilization of archives in colleges and universities is efficient and convenient, which can meet the diversified needs of teachers, students and the public and promote the sustainable development of archives in colleges and universities. Based on the development and construction of Digital Archives Resource Platform, the Weifang Medical University archives remote utilization service realizes "Remote Archive searching and one-stop service"[8]. Access platform covers identity authentication, data file encryption transmission, File Application Review, payment, statistics, monitoring, business configuration and other functional modules. The system data package can provide the end-user with personal basic information and education information data, business data of university service management and data stored in electronic files. The last kilometer of archives online service has been opened up, and the office of one-net communication has been realized, creating a new benchmark for remote archives utilization.

3.1.3. Strengthen the front-end electronic archives evidence awareness in the front-end

This research should enhance the awareness of evidence, and solidify the content and verify the integrity of the key nodes of the formation, archiving, transfer and long-term preservation of electronic archives. This study evaluates the trusted status of electronic archives under dynamic changing environment, the effectiveness of maintaining electronic archives evidence, and the whole process of electronic archives management. In 2011, the Chongqing University of Posts and Telecommunications established a platform centering on third-party certification of electronic data, based on its own patent technology for electronic data preservation. The platform was piloted in courts at all levels in Chongqing and some in Beijing, in 2018, Hangzhou Internet Court took the lead in introducing blockchain technology, establishing a blockchain evidence review model and standardizing electronic data authentication. In 2021, the Archives and data preservation center of Su da su aviation is connected to the “Suzhou notary chain” to further enhance the preservation effect of archives and data on the basis of the original “Blockchain + judicial notarization” model, realize the original traceability of electronic archives data, integrity can be verified. In 2022, the Ningbo archives integrated hashing, Timestamp and blockchain technologies to build a trusted electronic public, document archiving and management system, effectively maintaining the authenticity of the collection of electronic archives [9].

3.2. Construction of Trusted Storage Remote Utilization System

3.2.1. Remote access to the registration interface.

User registration needs to be real-name authentication; login can be through wechat, QQ and other third-party account login. Students enter the school number, ID card number, and verification code to log on to the system. According to the ID card, student card two. Please upload the photo of student holding ID card or student card when you upload the information. After registration, click to confirm submission. If you do not want to register, you can click the delete button. When students see the registration information interface after submission, if “Material check” changes, and shows “Incomplete material”, the system prompts students to “Please remind the counselor to file the relevant materials”.

3.2.2. Remote utilization management interface

The student registration information can be seen in the remote utilization management interface. In the remote utilization management interface, you can enter the student number, name, date, query and other search registration information; you can also search for registration information by using the drop-down boxes of status, items and basis. Using the management interface, there are query, audit

ISSN 2616-7433 Vol. 6, Issue 1: 173-179, DOI: 10.25236/FSST.2024.060128

through, print, export, modify, delete, return and other buttons. The data that passes through the audit automatically enters the utilization sending interface.

3.2.3. Remote use of the send interface

Remote use of the send interface can see the information through the audit, including student number, name, ID card number, college, e-mail, processing items and so on. The transaction here is actually the result of the transaction. It is an electronic file that is automatically generated by the system after the Click and audit is passed. The remote use of the sending interface and the sending button, after clicking, the electronic files generated automatically by the system can be sent to the e-mail address registered by the user. There are also functions such as generating utilization number and generating post office express delivery information by using the sending interface. Generate post office express information, including the specific access to single number, generate face sheet, generate transaction mailing list and so on. When the status of the file is saved from “In school” to “Transfer out” the system automatically sends the courier number to the student's registered mobile phone, and reminds the student that his or her file will be handed over to the post office in the next few days, to achieve the express single number of accurate delivery.

3.3. Secure and Reliable Implementation of File Remote Utilization System

At present, there are some typical application technologies in electronic file tamper-proof, such as reversible information hiding technology, file solidifying technology, hash value checking technology, digital signature technology and block chain technology, etc., based on the practical work and cases, this paper analyses the technology and its specific characteristics which are suitable for the extensive archives utilization service, and probes into the methods of improving the tamper-proof of the electronic archives information. The technology of block chain is used to judge the authenticity of electronic files on the network by the consensus mechanism, which is suitable for the authentication of the authenticity of electronic files on the chain; this method is no longer applicable. Based on the investigation and analysis of the unscientific, unreal and unsafe problems in the process of digital archives management and utilization in colleges and universities, this paper makes use of the invisibility of information hiding methods to improve the technical level, to evaluate the reversible information hiding technology model and validate the image information hiding algorithm through concrete cases, so as to ensure that the data file will not be compressed, rotated, geometric transformation and clipped, etc., it causes the embedded hidden information to be destroyed and lost, and can recover it well. Using the digital archives management system, a feasible scheme of “Reversible” protection is constructed. Digital file information stored in the electronic file management system, pre- “Embedded” hidden information [10], file users through file management and access rights to apply for download files, the “Restore” function of reversible information hiding technology can be used to check whether the file user has changed the electronic file in the process of transferring the file to the third party, through the technology comparison, the authenticity of the electronic file material is verified. Before the electronic file is authorized to the file user, the information hiding module is called to hide the information in the electronic file, and the information extracting module is called when the authenticity of the electronic file needs to be verified, verify the authenticity of electronic files during transmission. The “Reversibility” of archives is first to “Delete” the hidden information in the electronic archives, and then, according to the “Reversibility” of the algorithm, to “Reverse transform” the electronic archives back to their original state, if the recovered hidden information is consistent with the original hidden information, it proves that the electronic file is real [11].

4. Conclusion

Remote utilization of student files is a new service mode, which has great development potential and application prospect. In recent years, especially since the outbreak of covid-19, the research of University Archives staff has been a hot spot. Through the establishment of Student Archives Database, the development of file management system and the establishment of network service platform can effectively achieve the goal of remote use of student archives. In recent years, especially since the outbreak of covid-19, the remote utilization has been a hot spot in the research of University Archives staff. Through the promotion of digitization and incremental digitization of archives, we will focus on building archives data resources step by step, and constantly improve service capacity and level. Relying on digital technology, create file resource sharing in campus network. The new system of

ISSN 2616-7433 Vol. 6, Issue 1: 173-179, DOI: 10.25236/FSST.2024.060128

remote utilization of documents outside the campus network and data docking service between different units breaks the limitation of time and space, and realizes remote archiving and one-stop service. This provides more convenient and efficient access to services for teachers, students and alumni.

Acknowledgement

This work was supported by The 2023 project of the Jiangsu Provincial University archives research association is “Research on the remote utilization of university archives in the Digital Age” (project number: jsgdz2023-23); The 2022 General Project of Philosophy and social sciences research in higher vocational colleges, “Research on the improvement of digital literacy and skills in the context of digital transformation” (project number: 2022SJYB1246).

References

[1] Jane G. A probe into the digitalization of university student records and its remote utilization service -- taking the utilization service practice of National Sun Yat-sen University archives as an example. Lan Tai inside and outside, 2020(30): 53-54.
[2] Wang Xiaohui, Li Guohong, Li Qingzhao. A brief talk on the remote utilization of university student status archives: Taking the Yunnan University Archives as an example. Lan Tai inside and outside, 2020(2): 75-76.
[3] Liu Zixia, Xu Zhenzhe. Discussion on the optimization and upgrading of student archives management system in the background of intelligent campus. Landai world, 2022(1): 69-71.
[4] Zhou Xuefen. Analysis on the necessity and feasibility of comprehensive informationization of college student files. Lan Tai inside and outside, 2021(05): 1-3.
[5] Ma Renjie, Li Mengyun. Some problems about the application of block chain technology in the utilization of archives in our country. China archives, 2020(11): 76.
[6] Yu Caixia, Yao Ye. Analysis of the security policy of electronic file transfer based on Invisible Watermark. Archives newsletter, 2019(1): 40-46.
[7] He Shun, Yao Jianbo, Liang Haiying. An improved reversible watermarking algorithm based on JPEG image. Computer Simulation, 2020, 37(8): 219-223.
[8] Song Yong, Zhang Meng. Research on the technology of network trusted identity authentication. Cyberspace security, 2018, 09(3): 69-77.
[9] Peng Yongyong, Zhang Xiaotao. Research on key technologies of trusted identity authentication based on blockchain application pattern. Network security technology and Applications, 2018(2): 36 -37.
[10] Mao Runxia. Application of face recognition in new intelligent city construction. Technology and markets, 26(12): 35-39.
[11] Chen Jian, Lv Zhihan and Song Houbing. Design of personnel big data management system based on blockchain. Future Generation Computer Systems, 2019(101): 1122-1129.