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Research on Digital Management Construction of Surveying and Mapping Geographic Information Data Archives

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Abstract: In today's era of digitization and informatization, surveying and mapping geographic information data archives are important information assets in the field of geographic information. This paper discusses the digital management construction of mapping geographic information data archives. In terms of key technologies for digitization of digital management archives, the importance of data acquisition and finishing technology, data storage and management technology, and data retrieval and sharing technology is emphasized. At the same time, digitally managing archives also involves issues such as laws and regulations, data compatibility, and data authenticity, the resolution of which is crucial to guaranteeing the feasibility and credibility of digital management. The design and implementation of an archive digital management system is a key step to realizing the digital management of mapping geographic information data archives, which is of positive significance to promoting the digital management construction of mapping geographic information data archives.

Keywords: mapping geographic information data archives; digital management

Introduction

In contemporary society, the importance of geographic information data has become increasingly prominent, and mapping geographic information data archives, as an important part of this field, carries rich geographic, spatial, and environmental information, that has irreplaceable value. With the rapid development of information technology, the application of digital management in the field of archives has also attracted more and more attention. As the traditional manual management mode is difficult to cope with the increasingly large and diversified amount of data, the construction of digital management of surveying and mapping geographic information data archives has become an urgent and challenging task. By effectively shifting the mapping of geographic information data archives to digital management and making full use of advanced technical means, the efficient storage, accurate retrieval, and safe sharing of archives will be realized, providing new ideas and methods for archive management in the field of geographic information.

1. Overview of the Digital Management Archive of Mapping Geographic Information Data Files

1.1. Definition and characteristics of mapping geographic information data archives

Surveying and mapping geographic information data archive refer to the collection of all kinds of documents, drawings, data, and records generated in the field of surveying and mapping, geographic information and spatial information, covering geospatial location, feature attributes, measurement methods, environmental conditions and other aspects of information. It is characterized by the diversity and complexity of its data content, including maps, surveying and mapping results, remote sensing images, GIS data, etc., which have a high degree of spatial and temporal relevance. Surveying and mapping geographic information data archives is not only the carrier of geographic information but also an important foundation to support geographic decision-making, urban planning, resource management, and other fields. Traditional manual management makes it difficult to meet the demand for efficient management of its massive data, and

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digital management can better guarantee data integrity, convenient retrieval, and long-term preservation, so the application of digital management in this field has broad prospects.

1.2. The concept and advantages of digital management of archives

Digital management of archives refers to the process of transforming traditional paper or unstructured electronic documents into digital form and storing, managing, retrieving, and sharing them through information technology means. Digital management of archives has gradually become one of the main trends in modern archive management due to its high efficiency, accuracy, and sustainability. Its advantage lies in the fact that it can realize a high degree of integration and automated processing of archive data, improve data utilization and management efficiency, reduce human error in operation, and at the same time, facilitate the realization of multi-dimensional data retrieval and analysis, and strengthen the security and long-term preservation of data. In the field of surveying and mapping geographic information data archives, digital management can better cope with data diversity and spatial and temporal characteristics, providing strong support for the effective management, sharing, and utilization of data, which is of great significance for the management and application of surveying and mapping geographic information data archives.

2. Key Technologies for Digital Management of Archives

2.1. Data acquisition and finishing technology

Data acquisition and finishing technologies play a key role in digital management archives, and they are the basis for digital conversion and data quality control. Data acquisition technology covers a variety of methods, including scanning, photography, digital mapping, etc. These methods can convert paper documents, drawings, etc. into digital format. The acquisition process needs to take into account factors such as the accuracy and resolution of the equipment to ensure the accuracy and completeness of the source data. Data finishing technology, on the other hand, involves classifying, archiving, and cleaning the collected data so that it conforms to a standardized data format and structure. This includes normalization of data fields, data de-weighting and supplementation, and repair of possible noise or errors. Organized data are easier to store and manage and provide a reliable basis for subsequent retrieval and application (Zhou & Liu, 2021). The role of data capture and organizing techniques in digitally managing archives is crucial. Through accurate data collection and an effective organizing process, the quality and usability of digitized archives can be ensured, laying a solid foundation for subsequent storage, management, and application.

2.2. Data storage and management technology

Data storage and management technologies play a crucial role in digitized management archives, and they directly affect the security, reliability, and manageability of data. Selecting appropriate data storage solutions and management methods is crucial for long-term preservation and efficient retrieval. In terms of data storage, a reasonable choice of database system is key. According to the amount and nature of data, relational databases, document databases or graph databases can be selected to meet the storage needs of different types of data. At the same time, data storage needs to consider redundant backup strategies to ensure the security and recoverability of data in case of hardware failure or disaster. In terms of data management, establishing a perfect data management process and authority control is a key step. Define the access rights, editing rights, and sharing rights of data to ensure that only authorized personnel can operate on the data (Min, 2022). In addition, data standards and metadata management specifications need to be developed to better organize and retrieve data. The application of data storage and management technologies in digitally managed archives is the basis for ensuring data security, efficient management, and continuous availability. Through appropriate storage solutions and effective management strategies, the reliability and manageability of digitized archives can be ensured, providing strong support for the long-term preservation and value of archives.

2.3. Data retrieval and sharing technology

Data retrieval and sharing technologies are another key technology in the digitized management of archives, and they determine how quickly users can find the information they need and share the data with others. Effective data retrieval and sharing techniques enhance the availability and value of data and promote collaboration and innovation. Data

retrieval techniques include building appropriate indexing systems and search engines that enable users to perform quick searches by keywords, attributes, time, and other criteria. When establishing the index, it is necessary to consider the characteristics of the data, select appropriate index fields, and establish a standardized classification system to ensure the accuracy and comprehensiveness of the retrieval results (Li & Chen, 2020). Data-sharing technology involves the construction of a sharing platform and permission control. The sharing platform can be an internal enterprise network or a public cloud platform. During the sharing process, the sharing scope, permission level, and access control of data need to be clarified to protect sensitive data and ensure compliant sharing of data. Meanwhile, metadata management is also an important part of data retrieval and sharing. Explicit metadata can provide users with key information about data content, format, source, etc., helping them to better understand and use the data and reducing the possibility of misunderstanding and misuse (Shao, 2018). The application of data retrieval and sharing technology in digitally managed archives is the basis for realizing the efficient use and extensive sharing of data. Establishing a high-quality retrieval and sharing system, can promote the flow and maximize the value of data and provide reliable data support for various application scenarios.

3. Key Issues and Solutions for Digital Management of Surveying and Mapping Geographic Information Data Archives

3.1. Laws and regulations and privacy protection issues

Laws, regulations, and privacy protection issues involved in the process of digital management of mapping geographic information data archives are a crucial and complex topic. Digital management involves a large amount of data collection, storage, processing, and sharing, so it is necessary to comply with relevant laws and regulations to safeguard the legality, compliance, and privacy of the data. As data is digitized, issues involving personal and business privacy become more sensitive. Privacy protection measures need to ensure that sensitive personal information is protected from unauthorized access and use in digitized files. In addition, the scope and purpose of data use need to be clarified to avoid violating relevant regulations. Countries and regions have their laws, regulations, and policies, and data flows need to follow these laws and regulations and obtain relevant licenses (Tang, 2023). Therefore, in the process of digitally managing archives, it is necessary to understand the relevant laws and regulations to ensure the legality and security of data. Transparency of digitally managed archives is also a key issue. For the collection, storage, processing, and sharing of data, the relevant parties need to be informed so that they understand the way and purpose of data processing. Complaint mechanisms also need to be put in place to enable parties to exercise their rights, such as accessing, correcting, or deleting personal data.

3.2. Format conversion and data compatibility issues

Inconsistency of data formats in digital management is caused by the fact that different data sources, devices, and software may use different data formats and standards. This inconsistency may affect the exchange, integration, and analysis of data, and therefore format conversion and data compatibility issues need to be effectively addressed. Format conversion involves converting data in different formats into a uniform format for uniform management and retrieval in a digitization management system. This needs to ensure that data do not lose information and accuracy during conversion and that the original quality of the data can be maintained. At the same time, format conversion also needs to consider the characteristics of different data types, such as maps, remotely sensed imagery, attribute data, etc., to select appropriate conversion methods and tools (Lou, 2012). The data compatibility issue involves data interoperability between different data systems. In digital management, there may be multiple systems and platforms, and there is a need to ensure that data can be seamlessly transferred and exchanged between these systems. Solving the data compatibility problem requires the development of uniform data standards and exchange protocols to ensure that data can be effectively transmitted and shared between different systems.

3.3. Problems of verification of file integrity and authenticity

With the digitization and conversion of data, ensuring the integrity and authenticity of data has become the key to safeguarding the value and credibility of archives. In the process of digitization management, data may be subject to the risk of accidental damage, incorrect conversion, or tampering. Therefore, it is necessary to establish a data integrity verification mechanism to ensure that data are not lost or damaged during conversion, transmission, and storage through checksums, digital signatures, and other methods. In addition, it is also necessary to establish a history of the data to track changes and modifications to guarantee the traceability of the data (Jiang, 2020). Meanwhile, the authenticity of the archive is also a key issue. Digitized data may have been edited, repaired, or processed, so there is a need to ensure the authenticity of the data, i.e., that the data has not been intentionally altered or falsified. Establishing mechanisms such as digital signatures, authentication, and data auditing can help verify the authenticity of data and prevent unauthorized data modification.

3.4. Design and implementation of archive digitization management system

The design and implementation of the archive digitization management system is a key step in realizing the digital management of mapping geographic information data archives. The design of the system needs to give full consideration to the characteristics and needs of digital management to ensure that the system can store, manage, and utilize archive data efficiently and safely. In the design stage, the functional modules of the system need to be clarified, including data acquisition, data storage, data retrieval, authority control, data conversion, and so on. Each functional module should consider user requirements and workflow to ensure the user-friendliness and practicality of the system. The implementation of the system includes the selection and configuration of hardware and software, database construction, and user training. Select appropriate hardware equipment and software tools to ensure the performance and stability of the system. At the same time, establish a perfect database system and data backup strategy to ensure data security and recoverability. User training is also an important part of the implementation stage so that users can skillfully use the various functions of the system. In the design and implementation of the archive digitization management system, it is necessary to work closely with the relevant departments and personnel to ensure that the system can meet the actual needs and be successfully put into use (Liu et al., 2019). A scientific and reasonable system design and effective implementation steps will provide solid technical support and guarantee the digital management of mapping geographic information data archives.

Summarize

In summary, in the field of digital management of surveying and mapping geographic information data archives, digital management of surveying and mapping geographic information data archives is of great significance. Digital management can improve the availability, security, and sharing of data and provide strong support for decision-making and application in the field of geographic information. The key technology of digital transformation is the basis for realizing digital management. Key technologies such as data acquisition and organization technology, data storage and management technology, and data retrieval and sharing technology constitute the support system of digital management archives, which collaborate to solve the problems of data transformation, storage, retrieval, and sharing. Meanwhile, compliance and privacy protection, format conversion and data interaction, data assurance, and credibility verification are challenges that cannot be ignored in the process of digital management. Relevant regulations and policies should be formulated and followed to safeguard data legality and privacy protection; standardized data formats and compatibility protocols should be established to facilitate data exchange and interoperability; and archive integrity and authenticity validation should be a core aspect of digital management to ensure data reliability and trustworthiness. The digital management of mapping and geographic information data archives is a complex and challenging task, but the benefits and value it brings cannot be ignored. By fully applying the key technologies and solving the

key problems, the digital management of mapping geographic information data archives can be better realized, bringing new opportunities and prospects for the development and application of the geographic information field.

Conflict of Interest

The author declares that he has no conflicts of interest to this work.

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