

On the Extremely Important Value and Significance of Scientific and Technological Archives to Public Institutions: Post-Print

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Date: 2025-07-09T00:00:00+00:00

Abstract

Objective: To investigate the significant role of scientific and technical archives in public institutions.

Methods: By expounding upon the content documented in scientific and technical archives, this study analyzes their value embodiment within the operational activities of public institutions.

Results: Scientific and technical archives faithfully record the actual circumstances of public institutions across research, production, capital construction, and other activities, constituting authentic reflections of history, facts, knowledge, and experience. They are capable of furnishing public institutions with historical documentation and scientific foundations.

Conclusion: Scientific and technical archives facilitate more scientific and precise situational assessment and strategy formulation for public institutions during decision-making processes, thereby bearing substantial significance for these organizations.

Full Text

The Immense Value and Significance of Scientific and Technical Archives for Public Institutions

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[Results] Scientific and technical archives record the actual conditions of public institutions' research, production, and infrastructure activities, serving as authentic reflections of history, facts, knowledge, and experience. They provide

historical evidence and scientific basis for public institutions. **Conclusion** Scientific and technical archives help public institutions make more scientific and accurate judgments and formulate strategies during decision-making processes, holding profound significance for these organizations.

Keywords: Public institutions; Scientific and technical archives; Technology empowerment; Scientific research; Management

CLC Number: G202

Document Code: A

Article ID: 1671-0134(2025)03-49-04

DOI: 10.19483/j.cnki.11-4653/n.2025.03.009

Citation Format: Yang Yawen. The Immense Value and Significance of Scientific and Technical Archives for Public Institutions [J]. China Media Technology, 2025, 32(3): 49-52.

In today's era of rapid technological advancement and burgeoning knowledge economy, public institutions serve as crucial drivers of social development, bearing key responsibilities in scientific research innovation, production services, and infrastructure construction [1]. Scientific and technical archives, as authentic records of these institutions' activities, function like a treasure trove of information whose value becomes increasingly prominent. Delving into the value and significance of scientific and technical archives for public institutions, and exploring how to better build and utilize them, has become an essential undertaking for enhancing management standards and core competitiveness [2].

From a macro perspective, global technological competition intensifies daily, making knowledge accumulation and innovation decisive factors for development. As vital entities in knowledge production and application, public institutions' scientific and technical archives represent not only precious internal resources but also important media for social knowledge exchange and cooperation. Against the backdrop of national innovation-driven development strategies, fully tapping into the value of these archives can propel overall social scientific progress and innovative development. From a micro perspective, as public institutions continuously expand and deepen their operations, demands for refined and scientific management grow ever higher. Scientific and technical archives encompass comprehensive information from project planning to achievement application, providing robust support for organizational decision-making, helping optimize resource allocation, improve work efficiency, and better fulfill public service functions. Therefore, research on the value and management strategies of scientific and technical archives holds important practical significance [7].

1. The Important Value of Scientific and Technical Archives for Public Institution Development

1.1 Providing Historical Evidence and Scientific Basis

Scientific and technical archives meticulously document comprehensive information about public institutions' scientific research, production, and infrastructure projects. These archives span from market research and technical feasibility analysis during project initiation, through experimental data and process parameters during implementation, to achievement reports and performance evaluation data upon project completion. This content appears in diverse forms and media—including text, charts, data, images, audio, and video—creating a complete historical project trajectory [3]. For instance, in a new material development project at a research institution, detailed records exist in the archives analyzing material performance requirements across different application scenarios during early-stage market research, and discussions on the advantages and disadvantages of various preparation processes during technical feasibility studies. Throughout implementation, every experiment's environmental conditions, procedures, data results, and analyses of anomalous data formed rich archival materials. During final acceptance, the achievement report's summary of the innovation and practicality of research outcomes, along with performance evaluation data providing quantitative analysis of project inputs and outputs, further completed the archival content. When conducting similar projects or optimization research later, these archival materials become invaluable references, avoiding redundant research and saving substantial time and resources. Through archival analysis, researchers can clearly understand past research directions and achievements, providing a solid historical foundation for new scientific decisions and making them more scientific and accurate.

1.2 Promoting Technological Innovation and Achievement Transformation

Scientific and technical archives contain numerous technological innovation achievements and intellectual property rights, representing a rich mine for public institutions' technological innovation and achievement transformation. Many archives document 阶段性成果 (stage achievements), technological breakthroughs, and lessons learned from failures during project implementation. In the archives of a medical device research institution, for example, detailed records document key technological breakthroughs during the development of a new medical device. When tackling technical challenges with the equipment's core components, the research team attempted multiple approaches, with records of failed attempts and improvement ideas providing valuable experience for subsequent researchers. Building upon this foundation, they successfully developed more advanced medical equipment [4]. By thoroughly researching and developing these archives, public institutions can uncover potential innovation points. Furthermore, intellectual property information in the archives—such as patents and copyrights—provides legal protection for achievement

transformation, facilitating the commercialization of research outcomes through technology transfer and cooperative development, thereby creating economic and social benefits. For instance, leveraging patent information in its archives, this medical device research institution collaborated with multiple medical institutions and enterprises to bring new equipment to market, generating considerable economic returns while improving diagnostic and treatment capabilities in the healthcare sector, yielding excellent social benefits.

1.3 Supporting Project Management and Decision-Making

Scientific and technical archives play an indispensable role in project management and decision-making processes. Project managers can gain comprehensive understanding of project history, technical routes, and implementation progress by consulting archives. During project application, referencing similar past projects' archival materials enables more accurate proposal writing and improves success rates. For example, when applying for an environmental protection research project, the team referenced archives from previously successful similar projects at their institution, drawing on experience in project objective setting, technical scheme design, and expected outcome presentation, then optimizing these based on the current project's characteristics, ultimately securing project approval [5]. During implementation, when encountering technical difficulties or progress delays, solutions from archives facilitate rapid decision-making and project direction adjustments. In a software development project, for instance, the development team encountered a technical bottleneck mid-project but found solutions to similar problems in past scientific and technical archives. After adapting these to current project conditions, they successfully resolved the issue and ensured project progress [7]. During project acceptance, archives provide detailed evidence, ensuring fairness and accuracy. Additionally, archives offer robust support for project evaluation and auditing, helping institutions comprehensively understand implementation effects and economic benefits.

1.4 Facilitating Knowledge Sharing and Exchange

Scientific and technical archives serve as important bridges for knowledge sharing and exchange among public institutions. Different institutions accumulate rich scientific achievements and management experience in their respective fields, and through archival sharing, they can achieve knowledge dissemination and diffusion. In research fields, sharing archives between universities and research institutions helps researchers understand cutting-edge research trends, avoid duplicate studies, promote interdisciplinary integration, and drive scientific progress and innovation capabilities across entire industries. For example, a university's artificial intelligence research team achieved important research results through interdisciplinary innovation by sharing scientific and technical archives with other research institutions, learning about international frontier research methods and outcomes, avoiding redundant research while drawing on research approaches from other fields [9]. Furthermore, archival sharing can strengthen

cooperation between public institutions and enterprises or social organizations, achieving resource complementarity and jointly promoting social development. In urban planning projects, planning departments, research institutions, and enterprises share relevant scientific and technical archives—planning departments provide urban status data and development plans, research institutions offer research results and technical solutions, and enterprises contribute practical experience and financial support. Through such archival sharing and collaborative cooperation, they enhance the scientific feasibility of urban planning.

1.5 Enhancing Archive Management Levels

The management level of scientific and technical archives directly reflects the overall management standards and operational efficiency of public institutions. Strengthening collection, organization, appraisal, preservation, and utilization promotes standardization and normalization [6]. Establishing a complete archival classification system and retrieval system facilitates convenient query and utilization. For example, a large research institution adopted a classification system combining thematic categories with chronological order while developing an advanced retrieval system, enabling researchers to quickly retrieve required archives through keywords, time ranges, project names, and other methods, greatly improving work efficiency. Employing advanced preservation techniques and equipment ensures archival security and integrity. This institution, for instance, equipped professional constant temperature and humidity storage facilities and adopted data backup and encryption technologies to effectively safeguard archives. Simultaneously, efficient archive management improves utilization rates and value, providing strong support for institutional work. Through optimizing management processes and information system construction, institutions can enhance management efficiency and decision-making levels, achieving scientific and modern management. For example, introducing intelligent archive management systems enables automatic classification, cataloging, and retrieval, reducing manual operations and improving efficiency. Additionally, utilizing big data analysis technology to mine and analyze archival data provides data support for decision-making.

2. Construction and Empowerment of Scientific and Technical Archives

2.1 Establishing Sound Management Systems

Public institutions must establish and improve scientific and technical archive management systems, clarifying responsibilities and requirements for each process stage. During collection, regulations should require departments to timely collect relevant documents during project implementation, ensuring completeness and accuracy. For example, institutions can develop detailed document collection checklists specifying file types and responsible persons for each stage, regularly inspecting and supervising collection progress. During organization,

unified classification standards and organization norms should be established for orderly arrangement and numbering. Institutions can reference international or domestic archival classification standards, refining and improving them based on business characteristics. For instance, classification by project type, discipline field, and chronological order ensures systematic and logical archives. During preservation, clear environmental requirements and security measures should be specified to prevent damage and loss [8]. Professional archival storage rooms should be equipped with fireproof, moisture-proof, and pest-control equipment, establishing check-in/check-out registration systems with strict control over borrowing and usage permissions. During utilization, strict borrowing and confidentiality systems must be established to ensure reasonable use and information security. Borrowing procedures and return deadlines should be clarified, with confidential archives encrypted and access restricted to prevent information leakage. Additionally, feedback mechanisms for archive utilization should be established to timely understand user needs and optimize archival services.

2.2 Strengthening Infrastructure Development

As information technology continuously evolves, scientific and technical archive management is transitioning from traditional manual paper-based management to modern microfilm management and electronic file conversion. Public institutions need to strengthen infrastructure development by introducing advanced archive management systems and equipment. Computer management systems should be adopted for digital storage and retrieval, improving utilization efficiency. For example, database technology can establish archival information management systems where paper archives are digitally scanned and entered, enabling rapid retrieval and online access [10]. System functions should be continuously upgraded and optimized to meet growing user demands. Electronic storage equipment such as disk arrays and tape libraries should be equipped to ensure secure data storage. These devices feature large capacity and high reliability, meeting long-term storage needs for massive archival data. Regular maintenance and testing of storage equipment ensures data security and integrity. Network security equipment such as firewalls and encryption devices should be installed to protect archive information during network transmission. Access controls and data encryption prevent illegal acquisition and tampering. Additionally, network security management should be strengthened through regular security assessments and vulnerability repairs to ensure stable and secure operation of archival information systems [11]. These facilities not only improve management levels but also provide timely and accurate information for rapid project response and decision-making.

2.3 Deepening Archive Development and Utilization

The value of scientific and technical archives lies in their full utilization. Public institutions should deepen development and utilization through organizing,

summarizing, and analyzing archival information to 挖掘 (excavate) potential value. On one hand, specialized topic catalogs and electronic document compilations can optimize and integrate scattered scientific and technical document resources for convenient query and utilization. For example, establishing specialized directory classifications for key research fields can centrally organize relevant research reports, experimental data, and patent information into thematic databases, providing convenient query services for researchers. Meanwhile, online archival service platforms can be developed to enable remote sharing and utilization of archival resources. On the other hand, advanced technologies such as big data and artificial intelligence can be employed for in-depth mining and analysis. Big data technology can analyze large volumes of research project archives to discover correlations and patterns, providing decision support for project planning and management. For example, analyzing input-output data from different projects can identify key factors affecting project benefits, informing resource allocation for subsequent projects. AI technology can intelligently retrieve and analyze textual information in archives, improving accuracy and efficiency. Natural language processing technology, for instance, enables intelligent retrieval where users input queries in natural language and the system automatically matches relevant archives while conducting semantic analysis for more precise results. Additionally, AI can analyze multimedia information such as images, audio, and video in archives to 挖掘 (excavate) more valuable information.

3. Practical Application in Our Institution

Since its establishment, our institution has attached great importance to the collection and organization of scientific and technical archives, with the Technical Department specifically responsible and having established a comprehensive “Scientific and Technical Archives Management System.” In terms of front-end control, during project planning and initiation, each department designates specific personnel responsible for document collection, organization, and review, with archives submitted to the Technical Department upon project completion and acceptance. Systematic collection and sorting begin at project initiation, forming complete scientific and technical project archives after final acceptance. In a large infrastructure project, for example, design drawings and feasibility study reports were collected and organized from the planning and design phase, with various construction documents and acceptance reports archived according to requirements as the project progressed, ensuring archival integrity and continuity [11]. Regarding process management, project documents are tracked and managed dynamically during implementation. The Technical Department regularly inspects each department’s archival collection, promptly identifying issues and providing guidance. During one research project, for instance, the Technical Department discovered irregularities in some experimental data records, promptly communicated with the project team to demand corrections according to regulations, thereby ensuring archival quality. Project management software is also utilized for real-time document management, enabling online stor-

age, sharing, and collaborative editing to improve work efficiency. In terms of end feedback, document archiving is made a necessary condition for project acceptance and delivery, ensuring synchronization between project acceptance and archival acceptance. Meanwhile, quality feedback and continuous improvement on archived documents enhance document quality and standardization [12]. During project acceptance, for example, the acceptance team strictly reviews archival completeness and accuracy, proposing corrective actions for non-compliant archives. Project teams resubmit after corrections until requirements are met. Additionally, an archival quality evaluation system quantifies archival quality, providing basis for management improvements.

Scientific and technical archives management is implemented with “three synchronizations” alongside “research, production, and infrastructure” activities: simultaneous deployment, implementation, and inspection. This means project task assignment synchronizes with archival requirements, plan progress inspection synchronizes with scientific and technical document completion inspection, and scientific and technical achievement acceptance synchronizes with scientific and technical archives acceptance. The Technical Department supervises and guides archival work, assisting departments with document collection, organization, archiving, and project completion acceptance. Department heads are responsible for archival completeness, accuracy, and systematic organization. The Technical Department tracks archival borrowing, storage, and destruction, submitting statistical reports as required.

Through these measures, our institution’s scientific and technical archives management has achieved remarkable results, providing strong support for research, production, and infrastructure development. In research, archives offer rich materials that help researchers quickly understand previous results, avoid duplication, and accelerate project progress. In production, technical specifications and operational procedures in archives provide standardized bases, ensuring smooth production and stable product quality. In infrastructure, complete project archives provide detailed drawings and materials for subsequent facility maintenance, renovation, and expansion, reducing management costs and risks [13].

Conclusion

In summary, scientific and technical archives hold extremely important value and significance for public institutions. They are not only witnesses to institutional history but also crucial resources driving institutional development. Public institutions should prioritize scientific and technical archives management and utilization, strengthening training and education for archival personnel to enhance management levels and service capabilities. Simultaneously, they should actively promote digitalization and intelligentization of archives, fully utilizing modern information technology to achieve efficient management and convenient utilization, providing solid guarantees for smooth project implementation and innovative development. In future development, as technology

continues advancing and institutional reforms deepen, the value of scientific and technical archives will become more prominent. Public institutions should continuously explore new models and methods for archives management and utilization to better serve institutional development and social progress. For example, with blockchain technology development, institutions can explore its application in scientific and technical archives management to enhance security and credibility. Integration with virtual reality technology can provide users with more immersive archival access experiences. Furthermore, strengthening cooperation with other units and organizations to jointly conduct research and practice in scientific and technical archives management represents an important approach to advancing the archives field.

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(Responsible Editor: Li Yansong)

Note: Figure translations are in progress. See original paper for figures.

Source: ChinaXiv – Machine translation. Verify with original.