Challenges and Strategies for Managing Digital Records in a Public Organization: Findings from the TEAM China Case Study

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Abstract

This paper will investigate and identify the key challenges to records management in a public organization, the China Aerospace Science & Industry Corporation Archives, with a particular emphasis on developing strategies for ensuring the authenticity of the organization's digital records. Following the research strategy of "thinking globally, designing nationally and acting locally," this paper will identify and recommend records management strategies at both a national and at an organization level to respond to these challenges. The framework of the proposed strategies will incorporate management policies, a management system and a training program. The findings are intended not only to be of use to public organizations but to other organizations in China and in other developing countries as well.

Introduction

Today, social information resources are undergoing a rapid process of electronization, resulting in an enormous increase and expansion in the creation and use of digital records. The wide application of digital records has brought us, along with obvious conveniences, a series of new and unexpected problems in records management, which has created both theoretical and practical challenges. This paper, based on the preliminary findings of a case study on digital records management carried out by TEAM China of the InterPARES 3 Project, in association with its test-bed partner, the CASIC Archives, aims firstly to isolate and describe the major bottlenecks in digital records management, especially in relation to the task of ensuring the authenticity of the digital records of public organizations, and secondly to propose corresponding solutions.

Brief introduction of the Test-bed Partner

Founded in 1950, the Archives of China Aircraft and Space Industry First Group, which is now called the China Aerospace Science & Industry Corp. (CASIC) Archives, is a professional archives for China's aerospace industry. This archives has two main functions: (1) industry management or administration, including the establishment of the aerospace industry archives management system and instruction of archives management within the industry and (2) entity management of the aerospace industry archives, including collection, arrangement, appraisal and preservation of records, the generation of statistics and oversight of the use of all of the industry archives of CASIC and all of its subsidiary companies and research institutes.

As for its organization structure, as shown in Figure 1, the CASIC Archives has seven offices or departments, including the general or central office, the business guidance office, the cataloguing office (in charge of compilation and research), the archives management office, the information technology center (in charge of information), the headquarters archives office (in charge of the
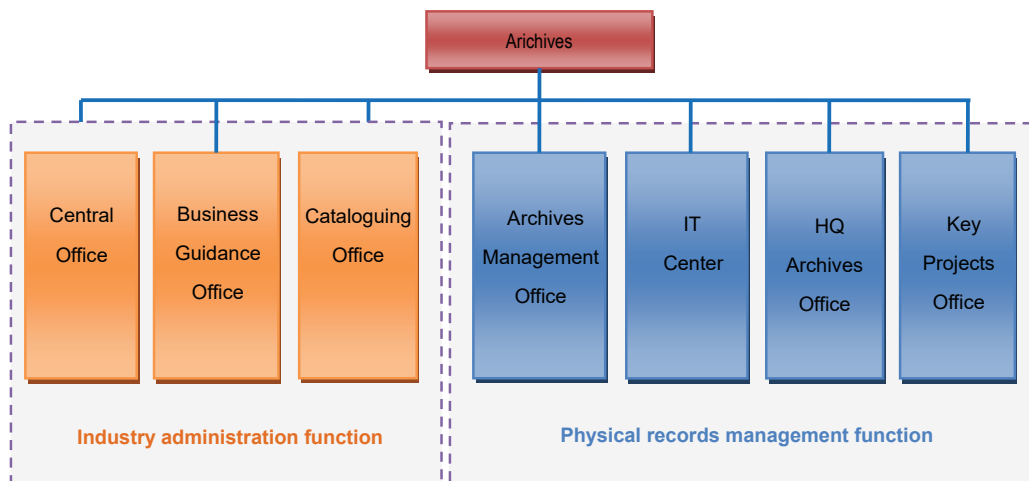

Figure 1. Organizational structure of the CASIC Archives

management of documents of the headquarters) and the key projects office.

The Archives is equipped with 37 full time employees and 60-70 external experts, with an average age of 45 and a 1:1 male to female ratio (see Figure 2). Among all the employees and external experts, over 70% hold at least a three-year college degree, while 30% hold a four-year college degree (or higher) and 80% hold a middle or advanced-rank job title.
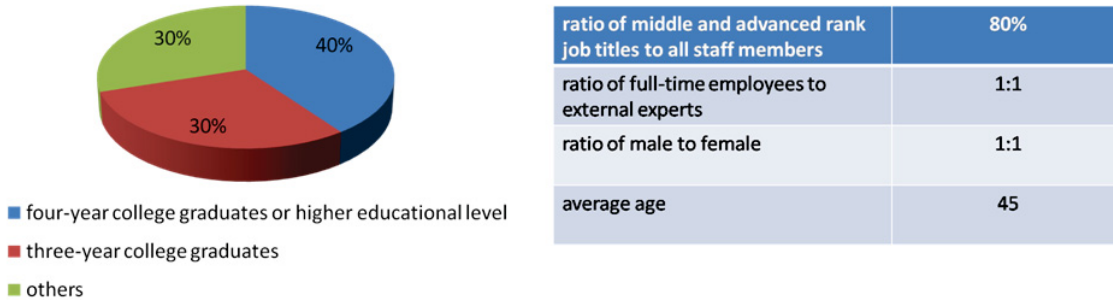

ratio of middle and advanced rank job titles to all staff members	80%
ratio of full-time employees to external experts	1:1
ratio of male to female	1:1
average age	45

Figure 2. Talent structure diagram of the CASIC Archives

Current Status of Management of the Digital Records of the CASIC Archives

The creation of digital records

As for the quantity of digital records, the Archives started to accept digital records in 2005. By the end of 2005, the Archives had received 579 thousand pages of paper documents and, in the year of 2008, over 85% of the annual total of received documents were digital records, of which half were born digital records and half were digitized copies of paper records.

The types of digital records received by the Archives include the following: text records, such as Microsoft Office documents (DOC) and Microsoft Works documents (WPS); image documents (TIFF, GD, PDF, JPG); and figure documents (two dimensional, three dimensional and CAD documents) (see Figure 3).

Different records management methods are used by the Archives depending on the record formats used during the creation and management of the records and the format is converted according to its security. PDF format is mostly commonly used for administrative management records, while CAD format is usually used for technical records. CAD records are the most numerous, while three-dimensional records are the second most numerous. TIFF is used when paper documents are digitized. At present, MS Office formats are seldom used for filing and conversion of digital records. Office automation (OA) procedures can automatically convert records into PDF or GD format.

As shown in Figure 4, the environments that the digital records are created in include the following systems: OA (office automation), CAD/CAM (computer-aided design/computer-aided manufacturing), CAE (computer-aided engineering), PDM (product data management), CAPP (computer-aided process planning), financial management, ERP (enterprise resource planning) and e-commerce.
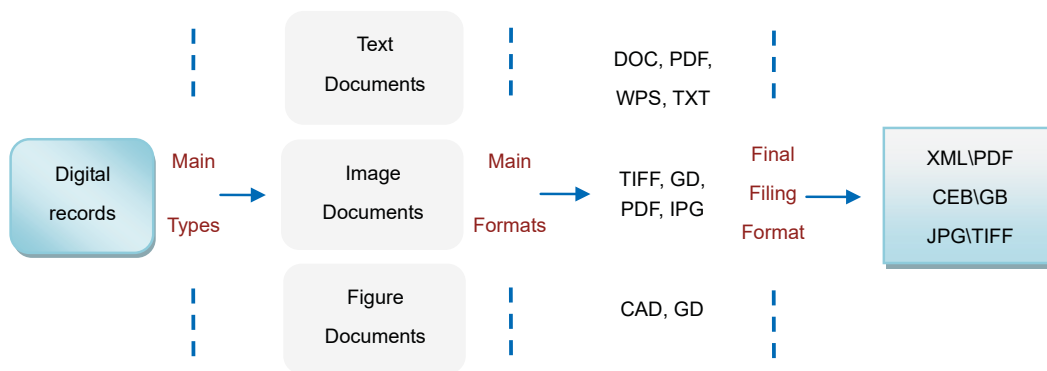

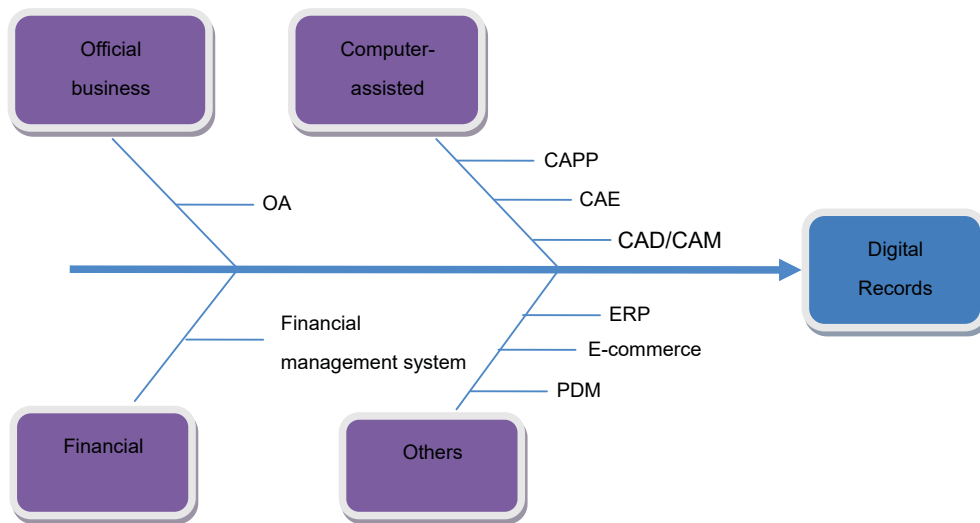**Figure 3.** CASIC Archives digital records types and formats

Figure 4. The production sources of digital records in aerospace industry archives

The construction of a digital records management system

At present, the management of digital records is generally based on the management regulations for paper documents. To meet the management requirements of digital records, the CASIC Archives has established a series of industrial digital records management standards, including *Management Methods of Aerospace Industry Digital Records* (promulgated in 2001), *Requirements for Integrated Management of Aerospace Industry Digital Official Records* (promulgated in 2006) and *General requirements for Aerospace Digital Program Document Archives* (promulgated in 2006) and now is promoting two research programs: the *Digital Records Metadata Management Specification* and the *Archive Database Construction Specification* (see Table 1). The *Requirements for Integrated Management of Aerospace Industry Digital Official Records* is comparatively complete and more specific for digital records management. It establishes the general principle for the integrated management of aerospace industry electronic official documents, process management requirements and metadata management requirements, primarily using as references the *Digital Records Filing and Management Specification* (GB/T 18894-2002) and the *Archives Referencing Rules* (DA/T18) issued by the China National Archives.

Table 1. CASIC Archives digital records management system and specifications

Name	Date established	Main function	Applicable scope
Management Methods of Aerospace Industry Digital Records	2001	Establishes the management principles, requirements and methods of aerospace industry digital records	Management of aerospace industry electronic official documents and files
Requirements for Integrated Management of Aerospace Industry Digital Official Records	2006	Establishes the general principle, process and metadata requirements of integrated management of aerospace industry electronic official documents	Management of aerospace industry electronic official documents and files
General requirements for Aerospace Digital Program Document Archives	2006	Establishes the requirements for the production, filing and distribution of documents during the digital design and production of aerospace products, as well as the requirements for the utility, copy, preservation, transfer, appraisal and statistics of digital files.	Management of aerospace product digital design and files

Digital Records System Framework

The Archives has established three comprehensive resources management systems: the OA system, the PDM system and the CAD system. The OA (Office Automation) system is responsible for the processing and filing of administrative records. There are three types of filing processes and procedures for administrative records:

1. The documents that need to be filed from the OA system are transferred to an intermediate base and, after a certain period of time or when a certain standard is met, are then transferred to the filing system;
2. The documents are transferred from the OA system directly to the filing system and then categorized and given a volume and mark volume number by filing personnel; and

3. The documents in the OA system are converted to XML format and then transferred into the filing system.

The PDM system is a product database system that mainly deals with drawing documents and technical documents. It has two types of filing processes and procedures:

1. Off-line filing, which involves inputting the documents on certain storage media and then transferring them to the filing system; and
2. Imitation of the procedures used to file documents in the OA system.

Major Obstacles and Challenges of Digital Records Management

With only about ten years' experience in digital records management research in China, great efforts are required either in theory or technology for further improvement. At present, digital records management in China is facing complex challenges and obstacles concerning both the state and the organization levels, which are influencing and restraining against each other.

Short-comings of the Existing Records Management System

First of all, the management system is out of date. The current management system is mainly adapted for paper documents. The laws, standards (see Table 2) and systems are lagging behind, at both the state and the organization levels, and no complete system framework or standard system has yet been established.[1] The current archives management system, specifications and standards mainly reflect the mode and way of thinking of traditional archives management and seldom addresses the needs of digital records. Even the established digital records management systems imitate or transplant conventional archival management concepts and ways of thinking and, thus, lack the effective measures and the proper procedures that are needed to ensure authenticity, which is the core issue in the management of digital records. The existing digital records management system has not redefined the filing scope and has only adopted the old filing scope of paper records. The metadata of digital records have not been taken into the filing scope, which directly impacts the ability of the system to ensure the authenticity of the digital records.

Table 2. List of specifications concerning the management of digital records in China

Name	Date established	Specification code	Specification grade
Requirements for optical disk storage, filing and archival management of CAD electronic records, Part 1: Filing and archival management of CAD electronic records	1999	GB/T 17678.1-1999	National
Requirements for optical disk storage, filing and archival management of CAD electronic records, Part 2: Information structure in an optical disk	1999	GB/T 17678.2-1999	National
Standards of electronic records filing and management	2002	GB/T 18894-2002	National
Specification for digitization of paper-based records	2005	DA/T 31-2005	Industrial
Standards of electronic document filing and management	2005	DA/T 32-2005	Industrial
Specification for the structure of electronic official documents based on XML, Part 1. General principles	2005	GB/T 19667.1-2005	National
Specification for the structure of electronic official documents based on XML, Part 2: Document body	2005	GB/T 19667.2-2005	National

Secondly, the management responsibilities have not been clearly defined. The functions and responsibilities of the document handling office, the IT center and the file management office have not been clearly defined; an effective cooperation mechanism has not been established and the archives management office does not entirely fulfill its role. Bottlenecks and blockages in the organizational mechanism and the low efficiency of management due to segmented management are the most obvious problems. For quite a long time, records management and archives management in China have been divided into two segments (see Figure 5): (1) current records management, which is the responsibility of the transaction department and the administrative office, and (2) archival management, which is the responsibility of the archives management office. Although it may appear that each office takes control of its own records management, the reality is that no office can take full and whole-process responsibility for its records management. Different offices establish and implement their own records management specifications and measures based on their own needs, which ultimately results in disorder of, or even conflict between, record management policies and specifications. The impact of this frustrating situation has intensified with the introduction of digital records and directly affects the ability of the Archives to ensure authenticity and long-term preservation of digital records.

Thirdly, there is a lack of system oversight and supervision. Many problems in the management of digital records in China originate from the absence of a comprehensive and mature supervision system for digital records management.

1. No tests have been implemented for digital records management systems. Up to now, no function certification standard or method for digital records management systems has been established, while the existing archival management software assessment has no professional criteria on which to depend. The current assessment criteria are too loose and put too much emphasis on form, which cannot meet the requirements of digital records management and have resulted in a flood of so-called "digital records management systems." Although nearly 70% of the surveyed organizations believe that they are using

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[1] Only 5 specifications are related to digital record management (3 are state specifications and 2 are industrial) in the 12 state specifications and 37 industrial specifications that are concerned with archives management in China. See Table 2.
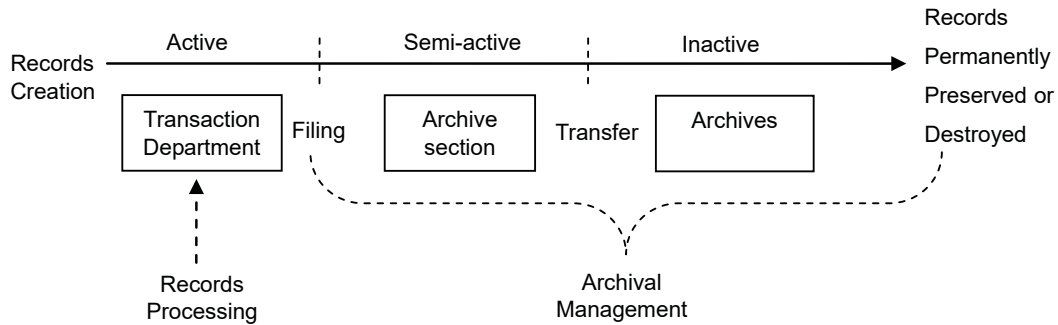
Figure 5. Lifecycle Records Management Model

digital records management systems, information obtained through questionnaires and through other means indicates that these same organizations do not actually understand the basic functional requirements of a digital records management system

2. Proper oversight and supervision measures have not been established for the digital records management systems. Many organizations have not specified who has the lead responsibility for digital records management, nor have they incorporated the duty of ensuring the authenticity, reliability, completeness and utility of digital records into the responsibilities of the related personnel in their archives, transaction and information offices. Some organizations have specified the management responsibilities of the related offices and departments, leaders and staff members for digital record management, but have not yet incorporated those responsibilities into the performance evaluation scope, nor have they established investigative and enforcement responsibilities, which severely limits the power of the existing specifications.

3. A digital records property audit system has not been established. As important organizational or national information properties, digital records should be checked, counted, evaluated and audited as tangible properties. To date, however, an audit system for information property, including digital records, has not been established in China. The digital records are excluded in the audit scope during the property audit; therefore, the true extent of the loss of digital records is unknown and cannot even be estimated.

In a word, many digital records are at risk of being lost shortly after their creation due, in part, to a lack of clearly assigned management and enforcement responsibilities, the lack of an audit system and the lack of a sense of responsibility and initiative, among the personnel in each office, to manage digital records.

Short-comings of System Construction

Digital records management must rely on certain software systems, which play an important role in guaranteeing the authenticity of digital records. However, the existing digital records management system has deficiencies related to various aspects of the development process and system functions that compromise the ability of the system to guarantee the authenticity of the digital records in contains.

First of all, there is a lack of a comprehensive and appropriate systems functional requirements analysis. The management requirements are not clarified, which causes a major defect for system functions in that the system cannot meet the management objectives of completeness, accuracy, authenticity and effectiveness. During development and design, the resources and requirements have not been effectively collected and integrated, all the key personnel related with records and archives management (such as archives management personnel) have not been asked to participate in the establishment of the requirements; therefore, the functions of the existing system are not complete and have many loopholes. For example, regarding system rights management, system management personnel are granted excessive rights, while the logging function is too weak; therefore, the authenticity of records cannot be fully guaranteed. Another example is that the automatic capture of metadata function is very limited, especially in quantity.

Secondly, development is not well-organized, such that the related design and testing processes can easily result in system loopholes. The technical development conditions are not advanced, which compromises one's ability to maintain the integrity and security of the system and its software. Under the existing system, records can be retrieved only by key words; there are no provisions in the system for retrieving records based on compatibility, weight allocation or sequence arrangement (records relationships).

Technical Obstacles

The technical support system for digital records management is not strong enough. As the products of information technology, digital records should be managed with the support of a strong technical system. Currently, key technology needed to meet the standards of digital records management has not been established and development of this advanced technology has been slow and has not been effectively promoted. Some of the most critical technical bottlenecks are discussed below.

Problem of partial upgrade and reconstruction of system

One of the key challenges is to be able to upgrade and reconstruct the existing system to meet the requirements of digital records management and the Internet environment while also ensuring that the existing system continues to function normally. For example,

an important goal is to develop a more intelligent retrieval function by strengthening and enhancing the functionality of the existing retrieval system to take the users' application habits and specific requirements into full consideration.

Compatibility between new and old systems

For example, how to ensure the close connection between the new and old systems in the transmission of digital records, including the integration of formats, metadata standards, management processes, etc.

How to ensure the digital records are interoperable with different system environments

For example, how to convert different records into integrated, normalized and/or open formats while still ensuring their authenticity during the process. Another example is how to ensure the compatibility of digital records created by different versions of the same application.

How to reduce dependence on technology-dependent authentication

Certain technologies, such as digital seals, digital signatures and other types of cryptography, often are used to protect and declare the authenticity of digital records at a certain point in time, especially when transmitting records between persons, systems or applications. However, excessive dependence of certain technology-dependent authentication techniques can create problems during records identification and appraisal, as well as during transmission of records between different systems and during the conversion of records into new versions or formats.

Personnel Obstacles

Outdated modes of thought

In China, many archivists lack a sufficient sense of the various ways in which records can impact the operations of, and bring value to, an organization, such as through their ability to reduce risk, provide evidence and help generate capital and profit. These workers ignore the value of digital records as evidence and are not aware that the paper document printed from digital records do include the metadata that are necessary to establish the authenticity of the records and improve their effectiveness. Moreover, certain special types of digital records, such as database records, video records, audio records, multi-media documents and super-media records, cannot be converted into paper copies. Some archivists are still trying tomanage digital records in the same way that they manage paper records, which poses many risks, not the least of which is compromising the ability of archives to protect the authenticity of the digital records and their value as information capital.

Lack of knowledge

The qualifications of digital records managers are insufficient to meet the more comprehensive management requirements for these types of records. Our archivists mostly are familiar with the methods of traditional archives management practices and, consequently, lack sufficient knowledge of digital records management and have little sense of, or competence in, the front-end control of records management or basic knowledge about information technology. They are not familiar with the functional needs of digital records and digital records management software and hardware; therefore, it is difficult for them to effectively communicate and cooperate with technicians. This, in turn, results in a disconnection between management personnel and technical personnel, which means that management and technology cannot be properly integrated. This is the major obstacle standing in the way of a rapid improvement in record electronization and digital records management.

In short, because the above factors conspire to confound our ability to protect the authenticity of digital records, the management of digital records is now facing great risks (see Figure 6).

Thinking and Solutions to Guarantee the Authenticity of Digital Records

Guided by a "define the problem → analyze the problem → solve the problem" way of thinking within a framework of action research, supplemented by survey statistics and the findings of the first two phases of the InterPARES Project and other digital records management research, the research team turned its attention to the digital records management difficulties and challenges faced by the test-bed partner, the CASIC Archives. Taking the permanent authenticity of digital records as the basic goal of digital records management, the research team probed for solutions to guarantee the authenticity of the digital records of public organizations, while developing a strategy of managing the state with digital records (see Figure 7).

Improve Mechanism and Strengthen System Construction

From the perspective of the state, digital records management should be included in the national information strategy to lead and drive organizations to incorporate digital records management in the organization information development plan. On one hand, the level of information construction affects the improvement of digital records management and, on the other hand, the level of digital records management impacts the realization of the profit of information construction. Therefore, the countries with advanced information construction have all integrated digital records management into their information construction strategies, as outlined in Table 3, which is something that China should emulate.
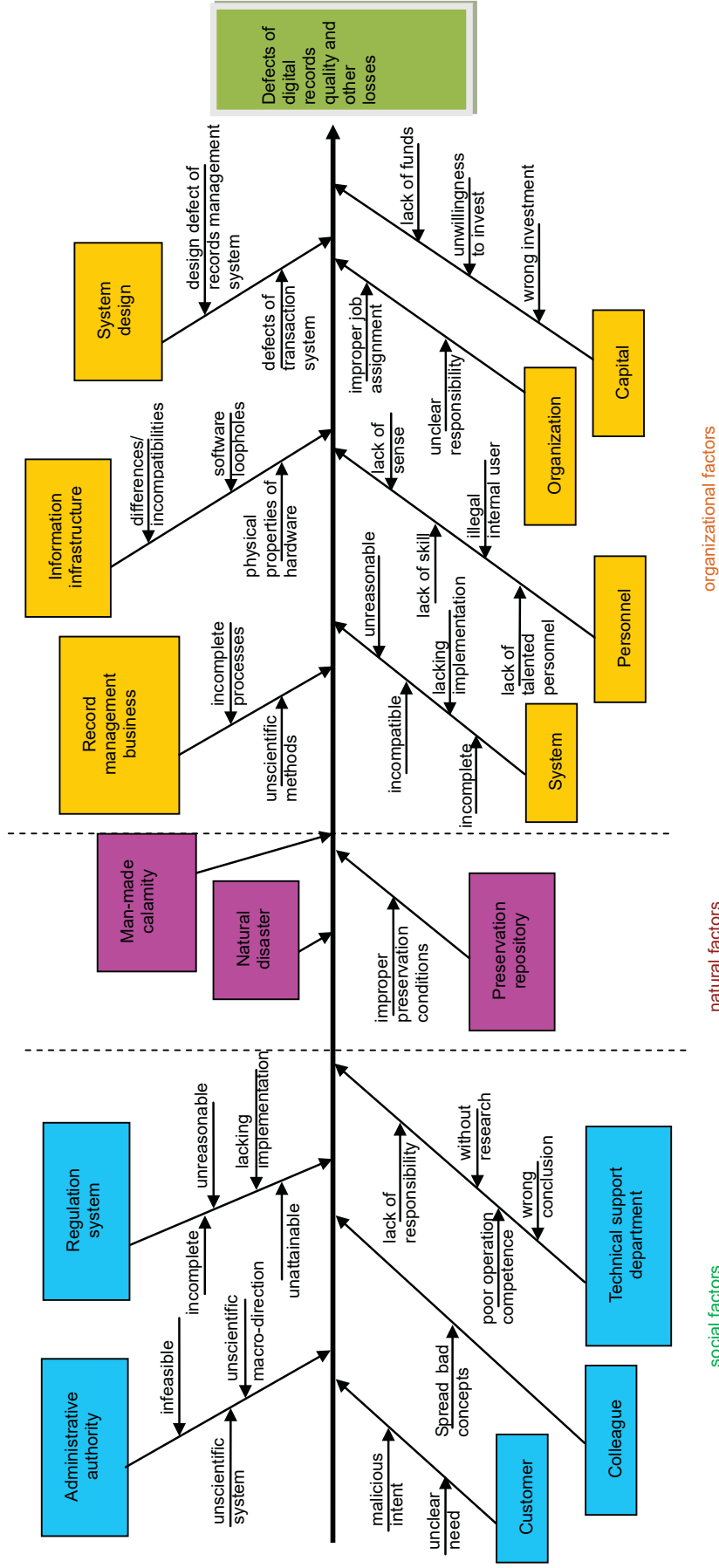
Defects of digital records quality and other losses

social factors · **natural factors** · **organizational factors**

Administrative authority — infeasible; unscientific system
Regulation system — unreasonable; incomplete; unscientific macro-direction; lacking implementation; unattainable
malicious intent; unclear need — Customer
Spread bad concepts; poor operation competence — Colleague
lack of responsibility; without research; wrong conclusion — Technical support department

Man-made calamity
Natural disaster
improper preservation conditions — Preservation repository

System design — design defect of records management system; defects of transaction system
Information infrastructure — differences/incompatibilities; software loopholes; physical properties of hardware
Record management business — incomplete processes; unscientific methods; unreasonable; incompatible; incomplete
lack of sense; lack of skill; lacking implementation; lack of talented personnel — System / Personnel
improper job assignment; unclear responsibility; illegal internal user — Organization
lack of funds; unwillingness to invest; wrong investment — Capital

Figure 6. Fishbone diagram of digital records risk factors[2]

[2] Feng Huiling, *Electronic Records Risk Management* (Beijing: Press of Renmin University of China, 2008), 38.
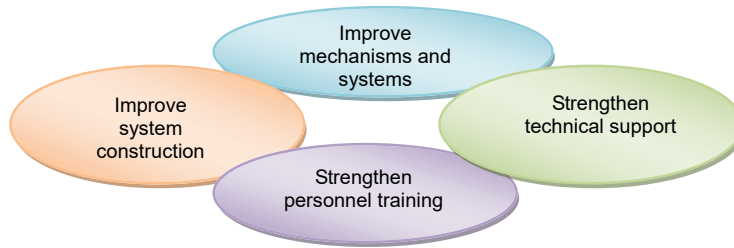
Figure 7. Framework of a strategy to guarantee the authenticity of digital records

Table 3. Relationship between information construction and digital records[2]

Information development stage	1st stage start	2nd stage All-around construction	3rd stage Resource integration	4th stage In-depth development
The strategic emphasis of information development	Develop and apply single information system	Construct all the information infrastructure	Realize the integration and share of information resource	In-depth development of information resources
Status of digital records	Small quantity	Quantity accumulation	Quality improvement	Great improvement in quantity and quality
Understanding of digital records	Side products of information development	Information resource	Important information resources, backup of information development content	Information property and knowledge property
Degree of centralized management of digital records	Scattered	Half-scattered	Centralized	Integrated
Utilization of digital records	Individual utilization	Multiple specific utilization	Cross-department, cross-organization utilization	All-society utilization
Current information development stage of China	Some areas and organizations	Overall level	Very few areas and organizations	

From the perspective of the organization, the authority and responsibilities of digital records management shall be clarified and an effective cooperative mechanism developed among personnel in charge of records transaction, archives management and software development so as to develop and improve a digital records management system that can meet all functional requirements. There is a need to strengthen the construction of management specifications and systems. At present, the CASIC Archives is developing Digital Record Metadata Management Specifications and an Archival Database Construction Specification (see Table 4), which, as a consequence, should lead to the gradual improvement of specifications.

Table 4. Digital records management specifications under development by the CASIC Archives

Name	Status	Main function	Applicable scope
Digital Record Metadata Management Specification	Under development	Specify the requirements of type, applicable scope, description rules and format for aerospace industry digital record metadata	Management of digital official records and archives in the aerospace industry
Archival Database Construction Specification	Under development	Specify the requirements, specifications and standards for the construction of an aerospace industry archival database	Construction of an archival database in the aerospace industry

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[2] The China Association for Science and Technology, "Report on Enhancing Scientific Management of Electronic Records for China," Document No. 35, July 22, 2008.

Improve System and Specify Functional Requirements

Ensure the authenticity of digital records by improving the digital management system

A scientific digital records management system is the essential prerequisite to implementing effective control over the creation, maintenance, use and preservation of digital records; therefore, greater emphasis should be attached to the analysis and improvement of the functional requirements of the digital records management system so as to meet the basic management requirement of authenticity. In 2007, the Aerospace Industry Group (AIG) started to upgrade the existing OA and archives management systems to realize the integration of the systems. Under the guidance of record lifecycle theory, AIG implemented not only the concept of integrated management of records and archives but also the front-end control strategy of archival management. AIG has reorganized the transaction process of digital records management and embedded the functional needs in the system. Now all the records have been classified and the archives management functions, such as retention and disposition, have been put in place in the records management sector.

Reorganize the digital records management process

To ensure the authenticity of the records, it is necessary to adjust the work of all the sectors involved in digital records management. For example, there is a need to implement real-time filing instead of segmental filing. During real-time filing, according to the preliminary appraisal results of the personnel of transaction or implementation, the archives department personnel perform re-appraisal on an intermediate basis and then establish and organize the index.

The Archives has many sources of digital records, to which are applied three filing strategies, including: off-line, regular on-line, and real-time on-line (see Table 5).

Table 5. List of digital record filing methods used by the CASIC Archives

| Filing method	Definition
Off-line filing	File the individual digital records
Regular online filing	File the digital records after transaction according to week, month or year through the computer network
Real-time online filing	Capture and file the digital records after transaction through the archives management system

It is important to strictly supervise the operation of the digital records system and to standardize the setting and changing of system parameters and user's rights. It is equally important to establish corresponding specifications and to regulate the work of every sector. In addition to the established *Digital Record Filing Management Method (trial)*, the *Digital Official Record Integrated Management Specification*, the *General Requirements for Digital Program Records* and the *Digital Record Archival Metadata Management Specification* are under development.

The *Digital Official Record Integrated Management Specification* provides regulations for the capture, registration, use and management of metadata in the integrated management of digital records.

The *General Requirements for Digital Program Records* provides specifications for the creation, filing, distribution and transmission, use, copying, appraisal, destruction and preservation of digital records, plus the generation of statistics about them, in product digital design and production. It also defines the filing scope of the digital records that are created in digital design, development and production.

Another important goal is to strengthen the backstage management and to improve the management functions of the system, which are divided into a system confidential management function, a system data management function and a system log audit function (see Figure 8). The system confidential function regulates and restricts the ability of different users to modify data. Any change of data must be performed by an authorized system confidential person and be audited by a log auditor so as to monitor the constant operation status of the system.

Finally, it is important to strengthen the identity recognition function to block access and operations by illegal users and to ensure the authenticity of the metadata.
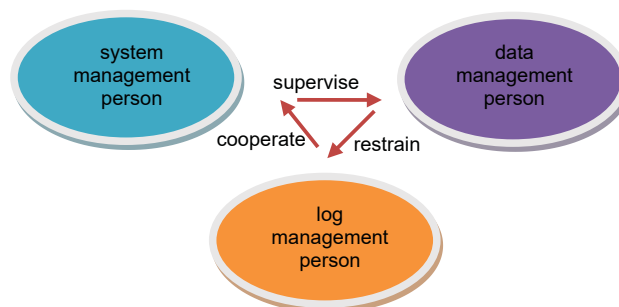
Figure 8. Diagram of "separation of three powers" of system, data and log management

Establish specifications for metadata management

Although metadata have a significant effect on the authenticity of digital records, China currently has no digital record metadata standard. Therefore, to strengthen the management of digital records in the aerospace industry, Digital Record Metadata Management Specifications are being developed so as to regulate the collection of metadata and to ensure the rational distribution of the collection points. As shown in Table 6, the metadata required by the new regulations will include: legal/administrative background metadata, metadata of the original information system description, source information metadata and creation/processing metadata, every category of which must specify the element, definition, description rule and type as well as the capture strategy.

Table 6. List of key metadata of the *Digital Record Metadata Management Specification* of the CASIC Archives

Subcategory	Element	Definition	Description rule	Type	Compulsory (optional) description
Legal/ Administrative background	Legal/ Administrative background	The file establishment organization's legal environment and administrative status	Describe the information such as description, organization type and nature	character	compulsory
Metadata of original information system description	IS description	Describe the related information of the system itself, such as information system software name, edition, development platform, function and developing organization	Automatically created by system	character	optional
	IS Environment	Describe the operation environment of the original information system	Mainly include related hardware equipment, operating system and operation platform	character	optional
Source information metadata	Fonds ID	The archives department assigns fonds or fonds ID	Assigned by archives department and then imbedded in the related information system	character	compulsory
	Archives Number	The Chinese phonetic alphabet abbreviation of the digital record creating department	Automatically created by system	character	compulsory
	Classification Number	Classification number of fonds	Created by imbedding the classification number of fond ID, process the original information system; the digital record classification number is automatically selected when the official record is created or selected by user	character	compulsory
Metadata of creation/processing	Processing type	Processing types. Dispatch: draft, check, approve and advise to implement. Receipt: advise to implement, approve to implement and implement	Automatically created by system during transaction	character	compulsory
	Processor	Name or identity of the processor	Automatically recorded by system during transaction	character	compulsory
	Time of accepting processing	Time of accepting processing	Automatically recorded by system during transaction	date	compulsory
	Time of processing	Time to write processing suggestion	Automatically recorded by system during transaction; if the processing type is "draft," the processing time shall be described with the time of drafting; if the processing type is "approve," the time shall be	date	compulsory

			described with time of approval		
	Time of sending out after processing	Time of sending out record	Automatically recorded by system	date	
	Processing suggestion	Processing suggestion according to processing type	Manually described by processor or select the processing suggestions set in the system; if the processing type is "approve," describe the suggestion for approval; if the processing type is "check," describe the suggestion for check	character	

Depend on Technology and Strengthen Technical Support

During the construction of the digital records management system, it is important to try to integrate management and technology to make them support each other. Currently, technology-dependent mechanisms, such as the use of digital seals and digital signatures, are the primary strategies applied to digital records to guarantee their authenticity. Through the digital official record transmission system, digital seals are imbedded into digital records to prevent any intentional or unintentional changes to the records. Likewise, digital signature technology is used to ensure the reliability of the sending and receipt processes for digital records as well as the authenticity of the digital records in the process of transmission.

Another technological measure that can be used to improve management of the digital records is to regulate their formats, including their storage and their filing formats. Firstly, this involves standardizing the filing format, preferably to one that is open source. Secondly, this involves restricting the format in the management system and, preferably, unifying the format with a transparent, international, open source format.

The proposed Digital Records Management System should:

- provide the best information channel for the organization to perform its functions and conduct its business;
- preserve the evidence of the organization's activities and transactions for as long as needed;
- integrate with the core transaction system of the organization on the platform of knowledge management; and
- provide information support and protection to enhance the core competence of the organization.

Provide Personnel Training and Strengthen HR Management

Update concepts

Firstly, this involves making sure that personnel are fully aware that digital records are tangible records that can be created and preserved as evidence and are as reliable and trustworthy as paper records as long as they are properly managed. Many theories and practices demonstrate that people can effectively manage digital records through the improvement of management methods and information technology. For example, with the aid of a digital record metadata specification and packing and transmission technology, digital records can be created so that they are less dependent on specific software and hardware systems and possess stronger self-description capabilities, which greatly increases the possibility of preserving the records in authentic form over the long term.

Secondly, it is important to cast aside the thinking of "dual-system" and "dual-set." Today, in China, "dual-system" and "dual-set" are adopted widely as strategies to counter the risks associated with digital records. Many organizations tend to have blind faith in these strategies and, unfortunately, consider them to permanent, *de rigueur* practices in digital records management instead of temporary measures.

We have to realize that the dual-system and dual-set strategies have fatal defects, for they cannot comprehensively meet the requirements of digital records management and preservation. First of all, many digital records, such as video documents, audio documents, database documents, multi-media documents and super-media documents, cannot be printed. Secondly, e-mails and digital orders may lose their power of evidence due to the loss of metadata when they are printed out. Thirdly, dual-system and dual-set strategies greatly increase work costs and reduce work efficiency. At present, China is the only country that continues to rely on dual-system and dual-set strategies to manage its digital records. In our survey, fifteen other countries, including the US, the UK, Australia, New Zealand, Sweden, Germany, Holland, Denmark, Norway, Finland, France, Canada, Singapore, Japan and Korea, are gradually implementing or have already realized the mode of single-system and single-set.[3]

Systematic training

The qualifications of digital records management personnel are crucial to the authenticity of digital records; therefore, it is necessary to strengthen personnel training to enhance the capabilities of records management personnel.

Based on the current conditions at the CASIC Archives, a series of training programs are ready and have been implemented. These training programs are designed to help the digital records management personnel equip themselves with the necessary knowledge and skills, including information technology skills, such as proper software and hardware maintenance training.

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[3] N. Zhang (2008) "Current Status of Electronic Records Management in China: Investigations and Thoughts," *Archival Science Bulletin* 6: 15-19.

The Archives can provide a four-level training system. The first level is post training for digital records management personnel, which provides general digital records information for new workers. The second level is specialized training, which is in-time training on new technology that is required in management. The third level is training for leaders, which is designed to provide training to leaders of digital records management departments on management concepts and thinking. The fourth level is degree education, which is realized through the cooperation with the information and resources management college of Renmin University to provide the professional backbone for systematic education in digital records management.

Future Steps

What we should focus on next:

- Enhancing the sense of modernization and making greater progress.
- Integrating the records and archives, which is the only way to go and can be realized only in the digital records environment.
- Determining the digital records management plan and mode most suitable for the organization; establishing regulations and standards and strengthening personnel training.
- Communicating with software development and program design departments, while considering technical support plans of different modes.
- Establishing rules for digital records management based on information environment.
- Enhancing all-around coordination, in-depth cooperation, complete integration and common improvement.

Author Biography

Jian WANG received her MA in history from the Renmin University of China (RUC, 1997) and has been a visiting scholar at the University of Michigan since 2004. She is a Professor in the School of Information Resource management at RUC, where she has also served as Assistant Dean. Her research is focused on digital records management. She is on the Board of the US National Archives and Records Administration Advisory Committee in the Electronic Records Archives (ACERA) and is a member of the International Standards Organization (ISO), CAC/TC 46/SC11 – Archives/Records Management. She has been an SC member of the ICA/SAE since 2005, and is currently also the Director of TEAM China of the InterPARES 3 Project.

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