

Digital Continuity Guarantee Method of Urban Construction Archives Based on Risk Management

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Abstract: With the broad application of information technology in urban infrastructure, urban construction has entered the stage of a smart city, forming many electronic records in urban construction. These electronic records play a vital role in the maintenance of urban infrastructure. However, electronic records often change in the process of urban construction. How to preserve the electronic records of urban construction became a significant challenge. In response to this problem, this paper proposes the use of risk-based management techniques to ensure the digital continuity, authenticity, integrity, and availability of electronic records.

Keywords: Electronic record, urban construction, risk management.

1 Introduction

With the rapid development of computer, network and information management technologies, new requirements have been put forward to the management of modern urban planning and construction [Wang, Gao, Liu et al. (2019)]. However, Data stored traditionally is easily tampered with Cui et al. [Cui, Zhang, Cai et al. (2018); Wang, Gu, Liu et al. (2019)]. The digitalization of urban construction archives is imminent. With the rapid development of various automated management technologies such as computers and digital technologies, human beings have entered the information age. Urban construction archives, as an essential record and information resource for urban construction, have become the critical issues for their final collection, scientific management and efficient utilization [Li (2017); Xiang, Wang and Gong (2015)]. The digitization of urban construction archives can efficiently archive and retrieve urban construction archives, which is the hallmarks of urban development and the improvement of modernization.

The digitization of urban construction archives is the core content of the digital city. The urban construction archives department can provide a geospatial data warehouse for urban construction and use it as a basis to share the urban construction information resources and lay the foundation for the construction of “digital city. Therefore, the digitization of urban construction archives has an irreplaceable role [Chen, Xu, Li et al. (2014); Chen, Wang,

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Xia et al. (2019)]. At the same time, it has also realized the urbanization, planning, management and service of digitization, intelligence and network.

However, there are various hidden dangers in the digital urban construction archives, such as the loss of archival documents and the more likely damages. Also, changes in the digital environment can easily lead to the inability of urban construction archives to be applied [Kim, Liu, Ren et al. (2016); Chen, Du, Pu et al. (2016)]. Countries face the loss of public digital information. In addition to doing intrusion detection [Wu, Zhang, Zhang et al. (2018); Xu, Jiang, Wang et al. (2018)], we also need digital continuity. As a new concept of information management and service, it has received worldwide recognition [Wang (2014); Xiao and Wu (2015)]. In theory, digital continuity can be traced back to the theory of records continuum. Records continuum theory is a new theory of record operations following the theory of record life cycle. Australian archivist F. Upward et al. define record continuum as a process of record reciprocation in the continuum from generation to disposal. The Australian Records Management Standard (1996) interprets the records continuum as consistent management of the entire process of records formation (including the design of the records management system) to the record as preservation and use of the record. Digital continuity is used to emphasize the long-term preservation of digital resources. It is mainly used to deal with the problem of missing or unreadable digital information such as electronic records caused by technological changes. Some scholars consider it long-term preservation of digital information [Zhang and Zhou (2017)]. Although this definition points out the core issue of digital continuity and represents the core goal of digital continuity, it does not point out that the nature of digital continuity is a continuous process, which is not only simple processing of long-term saving. After the 20th century, Britain, New Zealand, Australia, Queensland, Australia, and other countries and regions will be digital continuity into the government information management and service framework [Jia (2016); Zeng, Dai, Li et al. (2019)].

Managing change is key to ensuring digital continuity. Digital continuity requires the assurance of consistency between information, availability requirements, and the complex technical environment in which it is supported. Changes in these elements, even the seemingly small elements, can have a significant impact on user's ability to use digital information [Rostami, Sangaiah, Wang et al. (2019)]. Managing change means determining when user information is likely to be affected by changes, conducting impact assessments, understanding possible risks to digital continuity, and developing effective programs to ensure the availability of information through change. Therefore, this article takes the urban construction archives as the research object and adopts the risk management mechanism to study its digital continuity assurance method.

The rest of the paper is organized as follows. Section 2 introduces the related work. In Section 3, the problem of the preservation of urban construction archives are stated. Moreover, Section 4 gives our preservation scheme based on risk management. Finally, Section 5 concludes this paper.

2 Related work

The first country that explicitly proposed and implemented the continuous digital procedure was Britain. The national digital continual action was launched in 2007, which

focused on building and enhancing the assurance ability of long-term availability for the electronic record. The National Archives provided the core government departments with supporting guidelines, tools, services, and consultations for the development of digital continuity. It also requires the completion of the digital operation of the 95% government business activities in 2015. The information assets are registered and managed to ensure that the risks of various changes are manageable and controllable. By 2016, a series of digital continuity assurance frameworks were formed by the implementation of digital continuity management capability assessment for government departments [Zhang and Zhou (2017); Jia (2016)].

In order to solve the problem of ineffective digital information storage, and to construct an excellent digital environment and innovative government business operation mode, the government of New Zealand started in 2008 and released the digital continuity action plan in July 2009. The National Archives of New Zealand dominate the completion of the plan. The plan provides support and guidance, audit, and supervision for digital assets in the public sector. The digital continuity plan in New Zealand is based on a robust social technology architecture, which plans and implements digital continuity from technical actions, laid out infrastructures, social drives and economic sustainability, with background, goals, outputs, development processes, plans content and the global environment for digital continuity as a whole [Zhou (2016); Gou (2017)]. It is helpful to understand the scope of digital continuity, boundaries between objects of each digital continuity action, and actual deployment of actions.

In 2011, the National Archives of Australia released a digital continuity plan that incorporates the record continuum concept of business-driven management of information and provides principles and guidelines for the formation, management, conservation and exploitation of information in digital form. In 2015, in order to support digital transformation and e-government building in Australia, the latest digital continuity policy, Digital Continuous 2020, was released. It is an excellent highlight design of information governance from the management-oriented program specialization. Moreover, it focuses more on the overall situation and the future. It guides the government to provide better services through information, technology, people, and process assets.

Moreover, it will provide sustainable use of information for economic and social development and safeguard the rights and interests of citizens of Australian [Bi and Xie (2105); Jiang and Li (2015)]. The digital continuity plan has more layout, integrated, and well-planned top-level design, which emphasis on information governance philosophy and method to carry out digital continuity. Also, it plans the implementation framework of digital continuity as a whole in principle, with goal and route framework. The objects include information, data, records, systems, services, and processes.

The NARA of the United States opened the ERA project for digital preservation and long-term use in 1998. Moreover, the national library of Congress launched the national digital information infrastructure and conservation project in 2000 to preserve digital content for the future. In 2012, the president of the United States, Barack Obama, signed a record management direction. It requires the federal government to achieve paperless work by December 31, 2019, and to ensure that all permanently stored records be electronically administered, primarily in digital form as required by digital continuity form, manage,

preserve and utilize information. The United States has also released a series of open government policies to open data and big data. The control of the quality of digital information is a critical issue.

3 Problem statement

Unlike traditional paper documents, the authenticity of electronic records can no longer rely on originals. In 2010, the standard ISO15489-1: 2001 Information and documentation management: General, i.e., GB/T26162.1-2010 of China, list the authenticity of records as the primary characteristics. It defines that an accurate record should meet the following conditions. (1) The record conforms with the purpose for which it was made; (2) The formation and transmission of record coincides with its intended creator and sender; (3) The formation or transmission of the document is consistent with the fixed time. The purpose of the record, the sender and the sender, and the timing of the formation and delivery of these records are defined regarding the authenticity of the electronic record [Chen, Xu, Li et al. (2014)]. To ensure the authenticity of electronic records is the most critical objective of record management, the primary way to achieve it is the authenticity and evaluation of electronic records.

The characteristics of electronic records pose a significant threat to the authenticity of electronic records. The authenticity of electronic records is the key to ensuring the value of electronic records. Therefore, how to protect the authenticity of electronic records and how to evaluate the authenticity of electronic records is of great importance. The authenticity assessment of electronic records is the process of analyzing the personnel, system, technology, and other factors in the whole process of electronic record from generation to long-term preservation. Whether the electronic record is real or not is comprehensively judged. In the whole process of electronic record management, the record should continuously and uninterruptedly be under the supervision of the entire management system. Moreover, the system should avoid these records from monitoring. Otherwise, the digital continuity of the electronic record is destroyed. Moreover, the authenticity of the electronic record is lost.

One of the purposes of digital continuity throughout the electronic record management process is to maintain the authenticity of the electronic record information, which coincides with the purpose of electronic record authenticity assessment. The goal is to ensure the value of the smooth realization of electronic records. As the National Archives of New Zealand pointed out in the digital continuity plan: the purpose of the plan is to ensure that information is available and trustworthy, both now and in the future, when the public sector needs digital information. The British National Archives and the National Archives of Australia also mentioned the same element of trust in explaining what information is available. In short, the idea of digital continuity aims to maintain the authenticity of electronic records, while the authenticity of electronic records is used to prove the authenticity of electronic records.

4 Digital continuity guarantee method

4.1 Risk analysis methods

At present, the risk analysis methods have horizontal life-cycle phase analysis method and a vertical type analysis method. According to the horizontal life cycle stage analysis, this paper analyzes and identifies the risk of each stage of electronic record preparation (before formation), circulation, archival preservation, and long-term preservation of records. It is well-known that maintaining the authenticity, integrity, reliability, and availability of electronic records is an essential requirement for the safe storage and preservation of electronic records. However, the risk factors of untrue, incompleteness, unreliability, and unavailability exist to varying degrees in all stages of the electronic record life movement. There are human-made causes of these risk factors, such as non-compliance of workflow, disoperation, and vandalism, as well as non-human causes such as natural disasters and unexpected accidents in the cloud-internal causes such as lack of compliance with laws, poor infrastructure, uneven quality of personnel and others. There are also external causes, such as certain cooperative institutions and the supreme authority of the outsourcing system not controlled by this institution-the present management factors such as inconsistent rights and responsibilities and lack of a sound electronic record management system and others. There are also technical factors such as software incompatibility and cloud storage technology loopholes. Therefore, the organization needs to systematically identify the risk factors of all phases and investigate all the risk items.

4.2 Risk identification of electronic record

Risk assessment refers to the risk identification based on the relative importance of risks and priorities to analyze, to provide the basis for the management of electronic records. The risk factors for electronic records are not single, so the assessment of their risk should also be multidimensional.

The risk assessment is divided into three groups: management stage, risk accident, and hazard scope. The specific risk factors are the critical points in the three-dimensional space which are affected by various factors. In order to measure the risk value of each critical point, it is necessary to assign a risk level to each management factor group. Management stage group includes four phases: the formation of the preparatory, the formation of circulation, archiving, and preservation of long-term preservation. Among them, the formation of the preparatory phase determines whether the records are legal and whether the formation conditions are necessary. It is the most critical factor. Therefore, the risk value is set. Secondly, archives have original recordability. Once a fault occurs when it is formed, it is not only impossible to make up for the subsequent management stage, but even the threat of risk spread. Therefore, the risk factors that lie ahead of the life cycle of electronic records have a more significant impact on the management of electronic records. So, the risk values from the stage of the formation to the archives are respectively assigned to 1-3. In the group of risk accident factors, untruth is regarded as the most critical risk accident according to the significant degree of impact on the value of the organization's electronic record vouchers; the risk value is 4. It is followed by unreliable, incomplete, and unavailable. Moreover, the risk values are 3-1. According to the nature, scale and working practices of the organization, and referring to the standard "Guideline for Grading Security

Levels of Information Systems”, which prepared by the State Archives Bureau, the scope of the damage risk factors is divided into departments, Institutional, social and national, with a value of 1-4.

5 Conclusion

With the broad application of information technology in urban infrastructure, urban construction has entered the stage of a smart city, forming many electronic records in urban construction. These electronic records play a vital role in the maintenance of urban infrastructure. However, electronic records often change in the process of urban construction. How to preserve the electronic records of urban construction became a significant challenge. In order to solve this problem, the paper proposes using the technology based on risk management to ensure the digital continuity of electronic records for a long time, which will guarantee the authenticity, integrity, and availability of the records.

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