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**Report from the Government Records Service,
the Government of the Hong Kong Special Administrative
Region of the People’s Republic of China**

**Blueprint for Digital Preservation:
Consultancy Study on Long-term Preservation of
Digital Records by Government Records Service**

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INTRODUCTION

In view of the challenges of managing digital content in long term, the urgent need to establish and develop proper preservation policy, strategies and programmes have been widely acknowledged in the archive sector. The Government Records Service (GRS) of the Government of the Hong Kong Special Administrative Region of the People’s Republic of China (the Government of the HKSAR) has taken significant steps, including drive in digital records management, publication of digital records management standards and guidelines, and implementation of a digital repository, in response to the challenge of preserving digital records. These steps taken together have become the cornerstone for digital records management across the Government of the HKSAR. In August 2021, GRS also finished a consultancy study on long-term preservation of digital records (the Consultancy Study), the aims of which are to provide a more comprehensive, consistent and integrated framework for enhancing the digital recordkeeping capacity of the Government of the HKSAR and addressing the preservation needs of digital archival records. This report will give a review of GRS’ major initiatives on digital preservation, and introduce the findings and recommendations of the Consultancy Study.

MAJOR INITIATIVES

2. GRS is the central records management service agency of the Government of the HKSAR. It is responsible for formulating government-wide records management policy and requirements, reviewing and monitoring records management practices of Government bureaux/departments (B/Ds), and preserving the documentary heritage through identifying and preserving government records with archival value. Currently, GRS has a stock of over 1.7 million archival records in different media and formats. With more and more records created and collected in the course of business in digital form as well as a wealth of digitised archival records produced under our mass digitisation strategic plan, GRS has done tremendous work on the preservation of both digital and analogue records, and will strive for the best to meet the challenges and opportunities brought about by the rapid technological changes.

Drive in Digital Records Management

3. With the growing need for proper management of both digital and non-digital records in a consistent and integrated manner, GRS has formulated records management policy to pursue digital records management in B/Ds. Besides, the Government of the HKSAR has decided to roll out the electronic recordkeeping system (ERKS) to all B/Ds by end-2025 to enhance efficiency in preserving and managing digital records. GRS, in collaboration with other responsible counterparts, has started the preparatory work for the full rollout.

Publication of Digital Records Management Standards and Guidelines

4. To help B/Ds manage their digital records more effectively, GRS has issued a range of publications. It has provided guidance for B/Ds on the proper management of e-mails. A core set of recordkeeping metadata to be created, captured, used, managed and maintained in ERKS has been specified. There are also handbooks and guidelines for records management under hybrid environment, which advise B/Ds to plan for and implement preservation of digital records to meet the challenges of media decay and physical damage to hardware and storage media.

Implementation of a Digital Repository

5. Besides supporting and assisting B/Ds in implementing ERKS as well as providing digital records management standards and guidelines, GRS also anticipated an influx of digital records from B/Ds for permanent retention with the full rollout of ERKS. A prudent approach has been adopted in GRS to commence in late 2019 the establishment of a digital repository. In 2020, the digital repository was successfully installed, tested and launched. The digital repository's functionalities are based on the international standard ISO 14721:2012 "Space Data and Information Transfer Systems — Open Archival Information System (OAIS) — Reference Model" (OAIS Reference Model). By conducting risk assessments on the file formats of digital records in GRS' custody, those files identified with obsolete formats will undergo format migration in the digital repository according to the priorities set in the preservation action plan derived. In addition, backup in quadruplicate copies including off-site backup can guarantee full recovery of the repository system after unexpected disasters. Furthermore, regular fixity checking is carried out to detect any unexpected file change or corruption to ensure that all digital archival records are securely preserved with authenticity, integrity, reliability and usability upheld over time.

6. Currently, the digital repository is set up in the government cloud hosting platform which offers round-the-clock technical support service. The high scalability of the cloud service enables flexible upgrade and reconfiguration of the system for expansion in the future. While implementing the repository is an interim solution for GRS to store the digital archival collections, further studies would be conducted on its enhancement and integration with other GRS infrastructure to pave the way for the establishment of a digital archive.

CONSULTANCY STUDY ON LONG-TERM PRESERVATION OF DIGITAL RECORDS

7. Building on these significant steps taken by GRS in the past few years, the Consultancy Study further helps develop government-wide policies, strategies, guidelines and practices for long-term preservation of digital records created and maintained in B/Ds as well as those with archival value to be transferred to GRS for permanent retention. The Consultancy

Study recommends technical solutions to tackle long-term preservation of digital records in B/Ds and proposes strategies for implementation to ensure that these digital records are accessible for as long as they are required to serve legal, regulatory, business, operational, evidence and archival purposes. A suitable governance model with well-defined roles and responsibilities for both GRS and B/Ds is also proposed, with change management programme including staff training recommended to take forward long-term preservation of digital records in the Government of the HKSAR. The major recommendations of the Consultancy Study are highlighted in the ensuing paragraphs.

Approaches of Digital Preservation of Government Records

(i) Proposed preservation policy and strategies for GRS

8. A preservation policy framework, outlining the guiding principles and direction for effective management and secure preservation of digital archival records has been recommended for GRS to ensure that these digital archival records will remain authentic, accessible, understandable and usable in the future despite continuous technology obsolescence, media failure, physical loss, unauthorised changes, inadvertent release, etc. Key principles and requirements are proposed based on the OAIS Reference Model, which is widely used and accepted across the digital preservation community. Clear roles and responsibilities are also defined for GRS to commit to long-term preservation of digital archival records by a professional team with skills and expertise dedicated to the management of the digital repository.

9. In compliance with the preservation policy framework, several pragmatic preservation strategies are proposed for GRS to face technological changes. It is recommended that GRS should adopt both active and passive preservation measures. Active preservation measures such as conducting risk assessments and preservation action plans on file formats, monitoring technological changes and their potential impacts on the digital records, and conducting format migration and normalisation should be taken to mitigate the risk of losing its archival information. Apart from that, passive preservation measures are also required to securely maintain the digital archival records, including proper access and security control, backup and recovery for the digital repository. These strategies will

ensure sustainable accessibility of the digital content by the public in the future via online or on-site mode.

(ii) Guidelines for digital repository

10. The suggested preservation guidelines align with the standard-based activities defined in the OAIS Reference Model, i.e. ingestion, archival storage, data management, administration, preservation planning, and access to GRS' digital repository. Mechanism to cater for end-to-end process starting from transferring digital records from B/Ds to GRS, appraisal, accessioning and technical assessment of digital records, creation of submission information packages (SIP), storage of the archival information package (AIP), incorporation of metadata about digital records into the existing archival catalogue system and creation of access copies for access has been studied in the operation guide. Workflows have also been derived by making reference to the international best practices in the digital preservation community.

(iii) Technical study on GRS' existing systems

11. In supporting the digital repository for long-term preservation of digital records, enhancements to the capacity and functionality of existing systems in GRS for receiving digital records from B/Ds are necessary. Transfer planning with submission requirements to ensure B/Ds meet the transfer requirements of digital records to GRS for appraisal and permanent retention is proposed. A new transfer platform is recommended to provide computing infrastructure to enable a physically isolated storage to undertake virus testing, appraisal and assessment of technical viability of the received records for pre-ingest preparation. To facilitate better discovery and retrieval of the access copies, the ultimate aim is to integrate the digital repository with the existing archival catalogue system through purchase or development of an Application Programming Interface (API).

(iv) Proposed preservation policy and strategies for B/Ds

12. B/Ds are responsible for managing their records, regardless of formats or media as defined in the existing records management circulars and guidelines issued by GRS. In addition to GRS' existing practice, the Consultancy Study recommends a set of preservation policy for digital

records stored in ERKS, information systems and unstructured computing environments. Preservation strategies are also proposed for B/Ds to fulfil the requirements to upkeep their digital records. Various improvement areas have been addressed. They include developing an internal monitoring programme for B/Ds to implement digital records preservation programmes, prioritising transfer of digital records with archival value to GRS, using ERKS as the mechanism as far as possible for transferring digital records with archival value to GRS, assessing requirements for more complex digital preservation approaches and implementing practical preservation actions such as incorporating routine monitoring and conducting disaster recovery in information systems and storage media.

13. The policy and strategies for long-term preservation of digital records require B/Ds to develop their own digital records preservation programmes to identify appropriate storage media, file format, potential risks, approaches to preservation, etc. in their own contexts. It is crucial that all staff in B/Ds should be clear about their defined duties and actively play their roles to contribute to a successful digital records preservation programme. In this regard, the Consultancy Study has defined the responsibilities of B/Ds' staff in different layers, including records management staff, information technology staff, systems owners, etc., in the records management and preservation process.

(v) Preservation guidelines of unstructured records and business systems for B/Ds

14. Recordkeeping rules and guidelines will remain applicable to any new technology environment in B/Ds. In view of the impending full rollout of ERKS to all B/Ds, digital records in unstructured computing environment that need to be retained for long-term preservation are recommended to be captured and stored only in ERKS in the long run. Guidance on conducting system maintenance on ERKS, transferring records from B/Ds to GRS, disposal of records in ERKS including a range of practical advice on selection of storage media, transfer of digital records to GRS, notification to GRS of any sensitive or security classified digital records, and destruction of digital records are also proposed.

15. The Consultancy Study raises the need for enhancing the

management of records kept in business systems¹ of B/Ds to serve preservation purposes. In this respect, B/Ds should monitor the system design of their new business systems or their major system enhancements to ensure the proper functioning of the procedures and practices in the long-term preservation of digital records. Areas on access control, technical vulnerabilities, systems performance, audit trails and any customisation on the business systems have been studied. As no single approach fits for all types of business systems, five preservation approaches are proposed, including (a) integration of a business system with ERKS; (b) upgrading business systems and supporting document management systems with recordkeeping functionality; (c) capturing and archiving whole databases in Software Independent Archiving of Relational Database (SIARD) format; (d) using a multi-tenant version of the digital repository deployed by GRS; and (e) maintaining large data stores as digital repositories.

Proposed Implementation Methodologies

(i) Implementation plan and governance model

16. The Consultancy Study has proposed a 10-year plan to implement the recommended initiatives. The consultant recommended the establishment of a Task Force as a governance structure to take forward the implementation of long-term preservation of digital records in GRS and B/Ds through different pilot projects by phases. The pilot projects can be categorised as technology enhancement in GRS, and training and change management for both GRS and B/Ds. The Task Force led by GRS should further study the proposed initiatives and fine-tune the implementation details of each pilot project. We are positive to believe that the implementation plan provides a good framework, guiding GRS to transform and render the best assistance to B/Ds in preserving government records in the long term.

¹ A business system is an automated system that creates or manages information about a B/D's activities. It includes applications whose primary purpose is to facilitate transactions between an organisational unit and its customers e.g., an e-commerce system, client relationship management system, purpose-built or customised database, finance or human resources systems. Business systems that create or manage records should have the appropriate functionality for these tasks, or they should interface with other systems that manage the records. (Source: National Archives of Australia Recordkeeping Glossary)

(ii) Change management

17. In order to successfully adopt and implement the recommended initiatives, bridging the gap between the current practices in paper recordkeeping and records management requirements in the new digital environment for staff in B/Ds is deemed necessary. Pending the full launch of ERKS, the majority of B/Ds are still operating paper-based recordkeeping systems. Behavioural change is underway to maximise the use of ERKS and the transition from paper to digital recordkeeping. The consultant has proposed a series of integrated change management measures to be adopted in B/Ds, including a communication plan with clear roles and responsibilities defined, along with a monitoring programme for implementing the pilot projects related to the preservation of digital records in B/Ds. Furthermore, a transformation is proposed for GRS on archival records management from paper to digital, shifting the existing practices to suggested workflows according to the new functionality of the digital repository.

(iii) Staff training

18. Staff training is an important factor leading to the success of implementing long-term preservation of digital records. Staff awareness should be raised on the fragility of digital records and the know-how in sustaining the key characteristics of digital records. While digital preservation is an ongoing risk management task for GRS involving various aspects and diversified skills, it is incumbent to ensure the digital content is accessible over time with the support from a team of proficient staff in related disciplines. The Consultancy Study has proposed structural staff training targeted to shift the mind-sets of records management and information technology staff in B/Ds. It has also designed various training courses to furnish GRS staff with the necessary knowledge and skills enabling them to be authoritative, suitably knowledgeable and capable of advising B/Ds in digital records preservation.

CONCLUSION

19. Archives around the world have been facing significant challenges for long-term preservation of their records in an era of rapid technological changes. Building on various initiatives implemented in the

past years, the Consultancy Study acts as the impetus to shape a framework for GRS to commit to preserving digital records as evidence to serve legal, regulatory, business, operational, evidence and archival purposes. It has proposed the preservation policies and strategies, the suggested technical infrastructure, as well as a 10-year plan to implement the recommended initiatives through pilot projects by phases. Currently, GRS is working out the details to take forward the consultancy recommendations. It is expected that the implementation of the initiatives in the Consultancy Study will greatly strengthen the Government of the HKSAR's capacity in digital records management and the long-term preservation of digital archival records.