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International Scientific Review for Contemporary Archival Theory and Practice
35/2

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The figure of Atlant taken from: ATLAS NOUVEAU, Contenant toutes les parties du monde, Ou sont exactement Remarquées les Empires, Monarchies, Royaumes, Etats, Republiques etc. Par Guillame dI'Isle, a Amsterdam, Chez Jean Covens & Corneille Morties, 1733.

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Luka Hribar[1]

WHEN AI MEETS ARCHIVES: TESTING COMMERCIAL GENERAL-PURPOSE LLMS FOR TECHNICAL AND CONTENT-RELATED DESCRIPTION

Abstract

Purpose: *To test the usability and examine the limitations of general-purpose large language models (LLMs) in archival description. The study was designed as a quantitative/qualitative assessment to monitor trends in this rapidly evolving field.*

Methodology: *The experiment involved testing five AI services on a set of archival records. The set of questions and tasks was divided into two categories: technical tasks (page counting, structure recognition, optical character recognition – OCR) and content-related tasks, such as language detection, content summarization, and title suggestions. Performance was evaluated using quantitative and qualitative methods, along with archivists' assessments.*

Results: *A significant discrepancy was found between the models' performance across different types of tasks. The tested models proved unreliable in seemingly simple technical tasks, such as determining the number of pages or detecting graphical elements, while showing greater utility in complex content-related tasks.*

Discussion: *The analysis highlights that the tested LLMs are currently unsuitable for automating precise technical description processes but represent a useful analytical and generative tool for producing content summaries and descriptions. By observing how AI systems perform, archivists also gain better insight into potential difficulties faced by users.*

Keywords: *Archival records, artificial intelligence (AI), large language models (LLM), digital humanities, archival cataloguing and description, OCR.*

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1 INTRODUCTION

Over the past decade, digital transformation has profoundly reshaped the operations of archives, libraries, and museums (the GLAM sector). With accelerated digitization and the growing creation of extensive born-digital records, institutions are facing an exponential increase in data that exceeds the capacity of traditional, manual cataloguing and processing methods. In this context, artificial intelligence (AI), particularly large language models (LLMs), offers potential solutions. The integration of AI into archival practice, such as transcription, description, and content analysis, represents one of the key challenges and opportunities currently faced by the profession. The development of AI also promises the opening of so-called "dark archives" (Decker et al., 2022), which remain inaccessible to the public due to insufficient metadata, sensitive content, or disorganization.

The purpose of this research was to conduct a systematic test of the capabilities of several commercially available general-purpose LLMs in performing tasks specific to archival description. The primary goal was to investigate to what extent these services are already useful for archivists and external users, and to identify their strengths and limitations. Special emphasis was placed on understanding where the models function effectively and where systemic shortcomings appear that could affect trust and reliability.

The aim was not to identify every correct and incorrect statement in detail, nor to determine a single "winner," but rather to establish a foundation for monitoring future developments and to provide guidelines for the integration of AI into archival practice.

2 CATALOGUING AND DESCRIBING ARCHIVAL MATERIALS

The purpose of cataloguing and describing archival records goes beyond merely creating inventories or lists. Its traditional core task is to establish intellectual access tools that can also serve as descriptive surrogates for the physical material (Pezzica, 2023). These tools enable users to discover and understand archival material through accurate descriptions of its content and context. Describing represents a crucial task of the archivist, as it transforms or supplements the material into an accessible source of knowledge. With the advent of the web and the

provision of digitized materials, this role has also started to change. Younger generations of external, non-professional users are often unaware of the existence of certain archival tools (Hankins, 2019), such as archival inventories, which are sometimes attached to higher levels (fonds, collections, and series) rather than to the individual archival unit.

To ensure consistency and interoperability, archivists around the world rely on international standards such as ISAD(G), RIC, and others. These standards provide a common framework and structure for describing archival records regardless of their form (written, printed, or electronic). The principles include multi-level description, ensuring relevance at each level, linking descriptions, and avoiding redundancy. In our experiment, we did not require the AI services to present information in the form of any of these established standards. However, when formulating prompts, we strived to achieve relatively simple mappings of the results to appropriate categories. This also allowed for easier and more effective evaluation of AI's capabilities in producing descriptions consistent with professional requirements.

Describing archival material nevertheless faces numerous challenges. The primary problem that AI seeks to address is the quadruple deficit of resources: a shortage of adequately trained staff, specialized knowledge, funding, and time (Bingham & Byrne, 2021). These factors contribute to significant backlogs in archival processing worldwide. As a result, much valuable and interesting material remains undescribed or only at a very basic level, hindering discovery and use.

2.1 THE STATE OF DESCRIBING IN SLOVENIAN ARCHIVES

This section briefly presents data on the state of describing in Slovenian archives. The data, drawn from the ScopeArchiv software used by the Archives of the Republic of Slovenia and regional Slovenian archives, highlight the scale of backlogs and the lack of resources, further justifying the need to explore new methods and tools such as AI.

As of August 2025, the ScopeArchiv system contains a total of **3,455,690 records** with reference codes (i.e., archival units). Titles have been entered for **3,449,376 records (99.82%)**. The language(s) of the records are entered for **2,266,651 records (65.59%)**; script(s) are recorded for **2,032,542 records (58.82%)**; and the content description is filled for **825,316 records (23.88%)**.

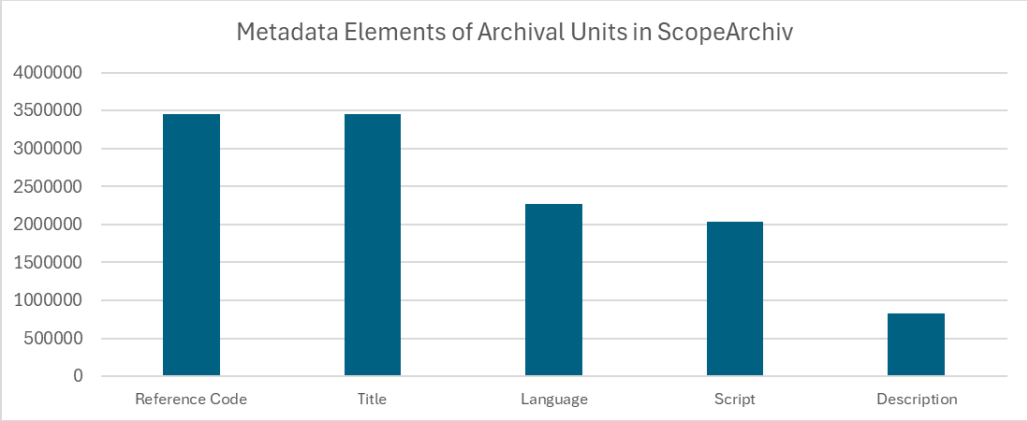


Figure 1: Metadata elements of archival units in ScopeArchiv.

As can be seen, the description field is filled with fewer than one quarter of all descriptive units. This does not necessarily mean that there is no information on content where this field is empty. Often, such information, if the record concerns a single document or a set of documents, appears at a higher level of archival hierarchy, such as in the series, collection, or fonds, or may be available in associated finding aids. Nevertheless, the data suggests that there is considerable room for improvement in content description.

Content descriptions are also of great value to users of the virtual, web-based, reading room (VAČ), many of whom struggle with search queries and are unfamiliar with the principles of archival description and data access.

3 ARTIFICIAL INTELLIGENCE IN ARCHIVAL WORK

3.1 A BRIEF OVERVIEW OF THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE

The broader development of AI began with attempts based on symbolic and rule-based systems, known as expert systems. These systems were designed to mimic human reasoning through predefined logical rules and knowledge bases. They were primarily developed to solve specific problems, for example in medicine or engineering (Brock, 2018).

Early systems were primarily designed for processing structured data. With the advent of machine learning, the focus of AI shifted from predefined rules to statistical methods, allowing computers to learn from large datasets. In this con-

text, Natural Language Processing (NLP) emerged, enabling computers to understand, interpret, and generate human language. NLP has proven to be a key technology for processing unstructured textual material, significantly reducing the limitations of early systems (Feng et al., 2024).

A revolutionary breakthrough in natural language processing came with the "transformer" architecture, which enabled the development of LLMs with hundreds of billions of parameters. This architecture made it possible for models to effectively process long sequences of data, resulting in advances in conversational AI, machine translation, text analysis, and text generation (Feng et al., 2024). These developments also open the door to the automation of archival processes such as transcription, cataloguing, description, and content analysis.

3.2 ARTIFICIAL INTELLIGENCE AND ARCHIVAL DESCRIPTION

In addition to scanning, Optical Character Recognition (OCR) forms a key foundation of most archival digitization projects, as it converts image-based material into machine-readable text. The quality of OCR is directly linked to the effectiveness of subsequent processes, including information extraction and search. LLMs build upon this foundation, not only recognizing text but also "understanding" and analyzing it within context.

Research on using LLMs for transcribing historical manuscripts indicates that they achieve significantly higher accuracy than traditional specialized software. However, challenges remain, particularly with low-resource languages. While some models have shown remarkable performance even in such situations, difficulties persist with older archival materials written in archaic language that are underrepresented in training datasets. This can result in inaccuracies in recognizing historical vocabulary and grammatical structures necessitating careful human verification (Kaluvilla et al., 2025; Khan et al., 2024; Humphries et al., 2024).

Nevertheless, the ability of large LLMs to combine concepts and expressions from multiple languages offers strong potential for working with multilingual archival fonds. Furthermore, LLMs perform well in summarization and named entity recognition, identifying key information such as topics, persons, places, and organizations (Zhang & Colavizza, 2025). These capabilities form the basis for automated archival description. Machine learning and NLP can also be lever-

aged to reveal connections within large corpora, thereby improving organization and contextualization of archival material (Cushing & Osti, 2023). Case studies where AI has been successfully introduced into different institutions suggest its suitability for automating archival descriptions (Arias Hernandez et al., 2024).

In addition, the integration of AI technologies promises progress in creating and enhancing metadata, which is crucial for ensuring accessibility of archival records. AI can reanalyze records when new material is added, enabling iterative updates and ensuring continued relevance (Fan et al., 2020). This is especially valuable in fast-changing situations, such as crises, where rapid action is required.

Despite clear advantages, concerns also exist regarding AI's use in archival description. The effectiveness of AI largely depends on the models being specifically trained for archival contexts. Given the opaque nature of many machine learning algorithms, explainability is also essential, particularly when establishing the context and meaning of records (Hou et al., 2022). These concerns are reflected in research on the ethical implications and potential biases embedded in AI processing frameworks, especially considering the complex nature of archival materials (Tenzer et al., 2024).

3.3 INTERNATIONAL PROJECTS AND ASSOCIATIONS

In recent years, several important international projects have emerged that focus on the research, ethical aspects, and practical application of AI in the management and accessibility of digital cultural heritage. These projects emphasize the crucial role of interdisciplinary collaboration among computer scientists, archivists, and humanists. Solutions for archival science are often developed within specialized communities, not solely by large commercial enterprises. **InterPARES Trust AI** is one of the fundamental projects addressing questions of AI usability and reliability in archival science. Ongoing studies include *Teachable AI for Arrangement and Description*. **AEOLIAN** and the related **AURA network** are focused on the challenge of "dark" digital archives, which remain closed to the public due to sensitive content, copyright restrictions, or other reasons. By leveraging AI-supported methods, they aim to selectively open collections and improve accessibility without requiring manual review of massive datasets. **LUSTRE** is a project focused on born-digital records, exploring the potential impact of AI on

these materials and on the work of archivists. **AI4LAM** is an open community initiative that serves as a hub for professionals and enthusiasts.

4 THE EXPERIMENT AND RESULTS

4.1 PURPOSE

The purpose of this experiment was to systematically test the capabilities of several publicly available LLMs in describing material from the Archives of the Republic of Slovenia, which may be the first such study in the Slovenian context. The rationale for this research stems from the following factors:

- The material is interwoven with texts in Slavic, Germanic, and Romance languages.
- Slovenian is a language underrepresented in large language models.
- Special emphasis was placed on older materials, which are also underrepresented in LLM training sets and are often difficult to understand for (external) users.
- To familiarize archivists with how currently popular AI services respond to users, so to better understand the issues and potentially adjust description strategies.

4.2 SELECTION OF MATERIAL

The material was chosen according to criteria that ensured independent replication of the study and legally and ethically unproblematic use. All material selected for the test is publicly available via VAČ and does not contain protected or sensitive data. This ensures that other researchers can repeat the analysis and test additional services.

Five descriptive units were selected for the test, each containing characteristics typical of real-world archival challenges (incomplete or missing OCR, mixed handwriting and print, text bleed-through, varied scripts and languages, archaic terminology, etc.).

1. **SI AS 730/2/1/1:** *Odloki, patenti, razglasi, okrožnice od 1725 do 1792* (Decrees, patents, proclamations, circulars, 1725–1792), file: SI_AS_730_2_1_1.pdf.
2. **SI AS 1073/II-37r:** *Vinogorski red iz leta 1543* (Viticultural Code, 1543), file: SI_AS_1073_495_(II-37r).pdf.

3. **SI AS 1080/1/2,3,7:** Three documents combined in one file:
   - Kapucinski provincial na Štajerskem, Koroškem in Kranjskem Silvester de Polcenico sprejme Burkharda Hitzinga [Hitzingkh] in njegovo ženo Sidonijo med duhovne otroke kapucinov, 1625 (Capuchin Provincial Silvester de Polcenico admits Burkhard Hitzing and his wife Sidonia among the spiritual children of the Capuchins, 1625), file: SI_AS_1080_I_2.pdf.
   - Papež Inocenc X. podeli odpustke bratovščini sv. Rešnjega telesa v župnijski cerkvi sv. Egidija v Višnji Gori, 1647 (Pope Innocent X grants indulgences to the Confraternity of the Holy Sacrament in the parish church of St. Giles in Višnja Gora, 1647), file: SI_AS_1080_I_3.pdf.
   - Kranjski deželni glavar Janez Gašper grof Cobenzl razsodi v zadevi zapuščine po pokojnem Francu Engelbrehtu pl. Zetschkerju, 1718 (Carniolan Governor Johann Caspar von Cobenzl decides in the inheritance case of Franz Engelbrecht von Zetschker, 1718), file: SI_AS_1080_I_7.pdf.
4. **SI AS 2048/HR DARI/2:** Zadeve mesta Reka (Rijeka), 1560-1714 (Affairs of the city of Rijeka, 1560–1714), file: SI_AS_2048_HR_DARI_2_273_08.pdf.
5. **SI AS 2048/IV/1:** Okrožnica Notranjeavstrijskega gubernija v Gradcu, s katero se zapoveduje, da cerkveni upravitelji ne smejo samovoljno ravnati s cerkvenim denarjem, 1788 (Circular of the Inner Austrian Government in Graz, ordering that church administrators may not independently manage church funds, 1788), file: SI_AS_2048_IV_1_in_Okroznica_in_1788.pdf.
6. **SI AS 2058/6:** Stenografske beležke Senata Kraljevine Jugoslavije, redni sklic, 16. rednega sestanka do 27. rednega sestanka, od 14. februarja 1933 do 10. marca 1933 (Stenographic records of the Senate of the Kingdom of Yugoslavia, regular sessions 16–27, February 14 – March 10, 1933), file: II-241_1933_knjiga_II.pdf.

Preprocessing included:

- Removing some pages (e.g., scanned covers with labels and notes) that could mislead recognition and analysis.
- Reducing the resolution of larger files to balance good OCR readability with processing speed.
- Removing descriptive metadata from file names, leaving only the reference code. This ensured that LLMs had to determine the content and context from the document itself, before potentially retrieving external information.

4.3 Selection of AI Services

The following services were tested, as they are currently popular and already widely used:

- **OpenAI ChatGPT 5 (CGPT5)** – Based on GPT-5, introduced mid-2025. Supports multimodal input (text, images, etc.), contextual analysis, and reduced hallucinations (https://chatgpt.com/)
- **Microsoft Copilot (COPLT)** – An AI assistant integrated into Office tools for document analysis and summarization, based on OpenAI and Microsoft technology (https://copilot.microsoft.com/).
- **Google Notebook LM (GNLM)** – A research tool that analyzes sources (PDFs, web pages, etc.), produces summaries, questions, and visualizations (https://notebooklm.google.com/).
- **Google AI Studio (GAIST)** – A platform for building multimodal AI apps, powered by Gemini 2.5 Pro and Gemma, emphasizing safety and responsible use (https://aistudio.google.com/).
- **Google Gemini (GGEM)** – A multimodal model (2.5 Flash/Pro), Google's direct competitor to OpenAI services, with browsing and integration capabilities (https://gemini.google.com/).

These services were chosen because they are widely used, multimodal, support multiple languages, and can perform OCR if needed. While GNLM, GAIST, and GGEM are all based on Gemini technology, they are optimized for different purposes (research, app development, general interaction).

4.4 COURSE OF THE EXPERIMENT

In this experiment, the goal was not precise measurability of correct and incorrect answers, since models are developing extremely quickly and such a detailed, time-consuming measurement would already be outdated by the time of publication. Instead, the emphasis was on a quantitative/qualitative approach and on establishing a reference baseline that will make it possible to monitor trends in suitability and performance in the future.

To ensure consistency and reproducibility of the experiment, the same protocols and questions were used for all services. The process began with a carefully considered prompt. Each LLM was first provided with a general instruction indicat-

ing expectations and specifying that the model should produce short, clear, and informative answers. This was followed by specific questions directing the LLM to extract precisely defined information, relevant for archival description. In this way, the outputs were oriented toward generating descriptive elements that could, without major difficulty, be mapped to a metadata schema such as ISAD(G).

The tasks were divided into two groups:

- **Technical tasks (1–6):** Determining the file name, number of pages, presence of text/images, assessment and execution of OCR.
- **Content tasks (7–16)[2]:** Language and script recognition, content summary, suggestion of a title, extraction of key entities (persons, places, time periods). Performance on content tasks was assessed by archivists with a four-point scale (from no good to fair), evaluations were divided into two categories: (A) usefulness/quality to the archivist describing the material and (B) perceived usefulness/quality to an external, non-expert user.

For each service we requested the use of the most up-to-date model available. Each service, in connection with each individual file, was given the same prompt in Slovenian language. Also, all responses were in Slovenian language.

The responses of all services for all tested files were copied into a single document, which grew to 168 pages, amounting to nearly half a million characters. Wherever possible, we enabled "deep reasoning" modes in the services, which in some services took up to 15 minutes to prepare a response. In the case of GNLM, we only asked questions 1–16 (without general instructions), as the service refused to accept the full prompt.

We partially edited the document and summarized the results in tabular form as meaningfully as possible. Summarization turned out to be extremely time-consuming and not without difficulties, since services sometimes returned not only the answer requested but also additional information or commentary, which occasionally enriched the response but sometimes made it ambiguous or even incorrect[3].

2 The processing of responses 12–16 has been reserved for subsequent articles due to their extent.

3 In a separate paper (in Slovenian language) in ATLANTI 2025 selected AI responses and tabulated results are published with running commentaries. In this paper only key findings are presented.

RESULTS FOR TECHNICAL QUESTIONS/TASKS

1. Question/task: State the name of the attached file

This question/task aimed to verify whether determining this parameter, which is important primarily for referencing, poses difficulties for the services. If AI processes only one file at a time, referencing is not problematic, but if it processes a bundle of files, it is very important that it always provides the correct file name. **General conclusion:** An apparently straightforward task showed that sometimes LLMs cannot access the file name. This fact must be considered particularly in cases where the file title itself is one of the key data elements. Such an example would be sensor measurement logs, where files are not necessarily equipped with appropriate headers.

2. Question/task: State the number of pages in the attached file

This question/task was intended to check whether determining this parameter, which is important above all for assessing the extent of material, causes difficulties for the services. **General conclusion:** A seemingly simple task demonstrated that even page counting, despite us explicitly asking for the number of pages in the PDF file, is not interpreted unambiguously by the tested LLMs. Problems occur when pages are also paginated. Some results are inexplicable; perhaps errors in the largest file relate to its extent (both in bytes and number of pages). Interestingly, some services sometimes returned the number of pages in words. Therefore, if we wanted services always to return data in numerical form (e.g., for automated procedures), we would apparently have to specify this explicitly.

3. Question/task: Identify on which pages there is text, and indicate page numbers without textual elements

This question/task was included to verify whether services can recognize document structure. This helps archivists in questions related to text extent and the ratio of text to graphic material, which is particularly pressing where OCR has not been performed, and it is difficult to determine the amount of text in characters and consequently the resources required for further processing. The third in the series of questions is essentially an extension of the first two, designed to test the usefulness of these services in determining the structure and form of scanned material. **General conclusion:** Even this supposedly simple task presented a hard challenge for many services. Possibly, in the case of the last file, the size of the

material exceeded the input capacity of the LLM, or the services failed to call the appropriate agents to perform the task. Yet at least one of the services completed it excellently. We may hope it is only a matter of time before the others follow.

4. Question/task: Identify on which pages there are images or photographs, if the file contains them

This question/task was posed for reasons like the previous one. There are situations, especially with long documents, where it is useful to know whether they contain visual material and how much. This allows an assessment of the necessary procedures for further processing, for example, preparing material for people with visual impairments, where documents must be supplemented with metadata for assistive tools or otherwise interpreted. **General conclusion:** When processing the results, it became evident that this question had been phrased somewhat clumsily. Perhaps we should have asked about the presence of graphic elements (photographs, images, illustrations, symbols, etc.). Nevertheless, the services performed the task relatively well. Once we received the answer that it was not clear whether the material contained images, once a service appeared to take a shortcut (trying to count image references). GAIST responded most consistently and correctly, drawing attention to aspects overlooked by the other services.

5.–6. Question/task: Does the file contain text recognized with OCR? Assess OCR quality. Perform OCR if necessary (for remaining tasks)

This question/task was included because searching archival material is much more effective if one can also search within the contents of archival units and not only in the description data prepared by the archivist. Materials are being digitized rapidly in many archival institutions, but OCR quality (when performed at all) varies widely. The hardest cases are manuscripts, older scripts, and older languages. Very few archives find the resources (staff, money, and time) to manually correct OCR. A rough estimate of OCR quality can be made by inspecting the extracted text; if it contains many garbled words, OCR is likely poor. A higher-quality evaluation requires re-running OCR with a better tool (or do it manually) and comparing results. We wanted to see how the services would tackle this task. **General conclusion:** The combined volume of responses concerning OCR presence, its quality, and the instructions to perform OCR (for the remaining tasks) if missing, amounted to over 25,000 characters, much more than expect-

ed. Services often ignored handwritten portions without OCR, focusing only on printed text with partial OCR. Where no OCR was present, they were confused, sometimes asserting that deficient OCR already existed. Some claimed to perform new OCR or corrections, others reported uncertainty whether they had executed OCR or not. Statements of confidence were ambiguous. Interestingly, some services tried to "fix" poor OCR (either preexisting or done by the service itself) by guessing from context, sometimes quite successfully. Overall, the detection of OCR presence and quality was highly inconsistent, and the services' self-assessment of confidence often did not align with actual performance.

7.–11. Content Questions/tasks

In this section, we sought to evaluate the adequacy of responses to questions concerning language, composition, content, and the suggested title for the material in the files. All five services responded to each of the six files with answers to the following questions:

- State the languages in which the text is written, if you recognize them.
- Does the file represent a single document, or does it contain multiple documents? How many, if more than one?
- Summarize the content of the file in a few paragraphs.
- Suggest a title or name that would be appropriate for the file if it were intended for a historian.

The services responded to these questions with varying levels of detail. We compiled all responses into a single document of about 40 pages (approximately 85,000 characters) and standardized the formatting to make it easier for archivists to conduct the evaluation. The quality of the answers was reviewed by archivists familiar with the material. Their task was not to determine all correct and incorrect statements in detail, but rather to provide two ratings for all four questions together, for the material assigned to them for assessment[4]. We asked them to rate (A) usefulness of the AI answers in assisting an archivist in descripting and (B) perceived usefulness of the AI answers in assisting an external, non-expert user. Every AI response was rated by two archivists (scale: 1 = no good, 2 = a little, 3 = fairly, 4 = very; "–" = the service could not process the file; format is A / B).

4 I would like to thank my colleagues Danijela Juričić Čargo, Žiga Koncilja, Branko Radulovič, Jure Volčjak, and Lilijana Žnidaršič Golec for their invaluable assistance and dedicated effort in evaluating the AI responses.

Table 1: Average ratings for questions/tasks 7–11.

File / Service	CGPT5	COPLT	GNLM	GAIST	GGEM
SI AS 730/2/1/1	2.5 / 2.5	2.5 / 2.5	3.0 / 2.5	3.0 / 2.5	3.0 / 2.5
SI AS 1073/II-37r	–	3.0 / 2.5	2.5 / 2.5	3.0 / 2.5	3.0 / 3.0
SI AS 1080/1/2,3,7	2.0 / 2.0	1.5 / 1.5	1.5 / 1.5	2.0 / 2.0	1.5 / 1.5
SI AS 2048/HR DARI/2	1.0 / 1.0	1.0 / 1.0	1.5 / 1.5	1.5 / 1.5	1.5 / 1.5
SI AS 2048/IV/1	3.0 / 3.0	3.0 / 3.0	2.5 / 2.5	3.5 / 3.5	3.0 / 3.0
SI AS 2058/6	3.0 / 3.0	–	3.0 / 3.5	3.0 / 3.5	3.5 / 3.5

In four cases, the AI was of no help at all (score 1). In twelve cases, it approached the threshold of being of little help (score 1.5). Twice it reached the value "a little helpful" (2), four times "fairly helpful," thirteen times between "a little" and "fairly helpful," sixteen times "fairly helpful," and seven times between "fairly" and "very helpful." The ratio of responses where it was not helpful to those where it was helpful is 1:2.5. The GAIST service received the highest number of top ratings.

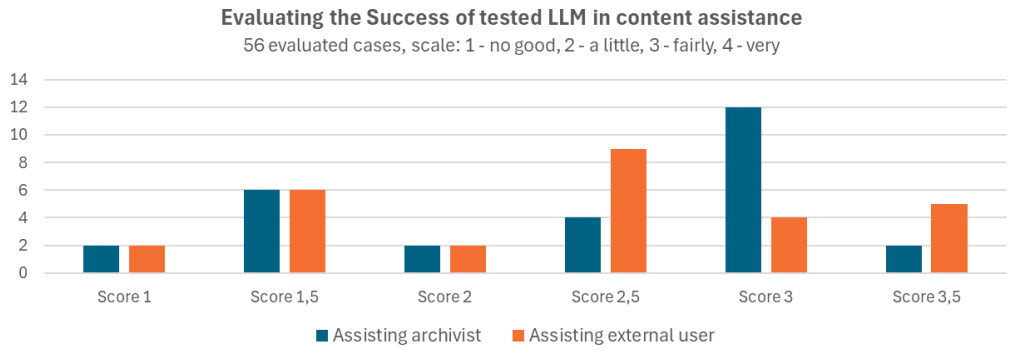


Figure 2: Chart showing the distribution of average ratings.

The average ratings by evaluated files: SI AS 730/2/1/1 (2.65); SI AS 1073/II-37r (2.75); SI AS 1080/1/2,3,7 (1.7); SI AS 2048/HR DARI/2 (1.3); SI AS 2048/IV/1 (3.0); SI AS 2058/6 (3.25). It is immediately evident that the best ratings were achieved by files that either already had OCR performed or where the service was able to successfully carry it out on its own.

5 DISCUSSION AND CONCLUSION

5.1 KEY FINDINGS

The results of the experiment clearly demonstrate that in tasks requiring technical precision, such as counting the number of pages, identifying blank or image-only pages, or determining the presence and quality of OCR, the services performed

poorly. Errors in these cases were frequent, often contradictory, and in many cases misleading. Such findings are highly significant because they indicate that archivists cannot rely on tested LLMs for these aspects of descripting, as the risk of incorrect data entry is too high.

By contrast, in content-related tasks the services performed considerably better. The ability to detect languages, summarize content, suggest titles, and extract key entities was judged positively. The services were shown to be useful both for archivists, as a support in creating initial descriptions, and for external users, who could gain a quick and reasonably accurate overview of the content. Nevertheless, the descriptions produced by tested LLMs are not flawless; they often contain errors, simplifications, or interpretative shifts. Therefore, they cannot replace professional descriptions, but they can be a valuable supplement.

The evaluations also revealed that the main factor influencing the quality of results is not the service itself but the type of document. Modern, clearly printed or those with OCR already performed, consistently received better ratings. On the other hand, older, handwritten, or multilingual documents with complex historical content received the lowest scores.

The comparison of the five tested services further showed that differences between them exist but are not decisive. In general, all services followed the same pattern: good results for modern and clear materials, poor results for older and complex ones. Individual deviations (e.g., GAIST receiving the highest number of top ratings) do not outweigh the overall trend.

5.2 LIMITATIONS OF THE STUDY

It is necessary to emphasize that this study has limitations. First and foremost, the experiment was limited to six files, which, although carefully chosen to represent a spectrum of challenges, cannot fully capture the entire diversity of archival material. For a comprehensive assessment, a significantly larger sample would be needed, covering a broader range of periods, languages, and types of records.

Second, the field of AI is developing extremely quickly; models are being updated or replaced every few months. The results therefore reflect the state at the time of testing and may soon become outdated. Future replications of the experiment with newer generations of services are therefore essential.

Third, the assessment of usefulness was carried out with the participation of a limited number of archivists. Although they were professionals familiar with the material, a larger and more diverse group of evaluators could provide an even more balanced assessment.

Finally, the experiment did not include a systematic analysis of errors or biases in AI-generated descriptions. While we noted examples of inaccuracies, this was not the focus of the study. A more detailed study of the types of errors, their frequency, and potential systemic causes would be an important step for future research.

5.3 DIRECTIONS FOR FURTHER RESEARCH

Based on the findings and limitations identified, several key directions for further research can be outlined:

1. Future studies should include a larger number of files that cover different historical periods, languages, scripts, and types of archival records. Particular attention should be paid to materials that are especially challenging for AI (e.g., manuscripts, mixed-language documents, records with archaic terminology).
2. Given the rapid development of AI, it will be crucial to repeat similar experiments regularly with newer models and services. This will make it possible to monitor progress over time and assess whether models are becoming more reliable and suitable for archival use.
3. More detailed research should be devoted to identifying and categorizing errors in AI-generated descriptions. This would allow a clearer understanding of where and why AI fails and how archivists can prepare to recognize and correct such errors.
4. Future work should explore how AI outputs can be more directly mapped to established metadata standards (e.g., ISAD(G), RiC). This would facilitate more effective integration of AI-generated descriptions into archival information systems.
5. It would also be useful to examine how different groups of users (professional archivists, historians, students, public) perceive and use AI-generated descriptions. Such studies could provide valuable insight into which functions are most useful and how AI can improve access to archival heritage.
6. While this study focused on general-purpose LLMs, it is reasonable to expect the emergence of specialized models trained specifically for archival and his-

torical material. Research should therefore also monitor this area and test the extent to which such models are more effective.

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Ameera Yahya Ahmed AL-Hooti[1]

THE USE OF BLOCKCHAIN TECHNOLOGY IN ARCHIVAL MANAGEMENT: TOWARD SECURE, TRANSPARENT, AND DECENTRALIZED RECORDS

Abstract

Purpose: *This paper examines blockchain technologies as instruments to strengthen archival management by providing verifiable authenticity, tamper evidence, and resilient traceability for digital records (Risius and Spohrer 2017; ICA 2021). It situates blockchain within Oman Vision 2040 and evaluates how distributed ledger technology (DLT) can be piloted and integrated with existing archival infrastructures (Oman Vision 2040 2022).*

Method/Approach: *A qualitative case-study approach synthesizes three evidence streams: international pilot project reports such as ARCHANGEL (ARCHANGEL Project 2018–2019), peer-reviewed literature and technical white papers (2017–2024), and semi-structured expert interviews and institutional readiness analyses from Oman. Thematic analysis examined three domains: integrity & authenticity, transparency & access, and institutional readiness & governance.*

Results: *Blockchain provides a cryptographic chain-of-custody and tamper-evident anchoring model for archival objects by writing content fingerprints to distributed ledgers while storing content off-chain (Kollwitz and Daugherty 2020; Stublić 2023). International pilots show feasibility; however, challenges include governance design, legal recognition, interoperability, cost, and capacity building (Saglik & Lemieux, 2023).*

Conclusion: *Blockchain is a promising augmentation to archival toolkits but is not a substitute for core preservation practices (Bendor-Samuel 2022). Recommendations include staged pilots in Oman, a hybrid architecture, standardized hashing and metadata practices, training, and regional consortia for governance and cost distribution.*

Keywords: *Blockchain; Digital Archives; Authenticity; Hashing; ARCHANGEL; Oman Vision 2040*

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1. INTRODUCTION

Modern archives face increasing challenges in guaranteeing the authenticity, preservation, and accessibility of records in a digital age. Traditional digital repositories, while advanced, remain vulnerable to cyber-attacks, unauthorized alterations, and centralized failures (Kollwitz and Daugherty 2020). Blockchain technology, with its decentralized ledger system and cryptographic security, emerges as a transformative innovation for archival science (Risius and Spohrer 2017; ICA 2021).

In Oman, the objectives of Oman Vision 2040 highlight the importance of digital transformation, knowledge preservation, and public trust in government records (Oman Vision 2040 2022). Integrating blockchain in archival management aligns with these priorities, offering solutions for authenticity verification, transparent access, and resilient preservation strategies (Saglik & Lemieux, 2023).

Digital records are the principal form of contemporary documentary heritage. Governments, corporations, and cultural institutions generate vast quantities of born-digital and digitized materials that constitute the societal memory. Ensuring the long-term integrity, authenticity, and accessibility of these records poses persistent technical and institutional challenges. Digital objects are prone to format obsolescence, bit-rot, malicious alteration, and losses that arise from centralized failures or weak provenance practices (Risius & Spohrer 2017). Traditional centralized repositories and preservation practices remain necessary, but increasingly insufficient without additional technical mechanisms that produce verifiable, third-party evidence of object integrity.

Distributed ledger technology (DLT), or blockchain, has emerged in the last decade as a means to provide tamper-evident, cryptographically-secure records that can be independently verified by third parties. For archives, the central practical promise of blockchain is the ability to anchor cryptographic fingerprints (hashes) of digital objects in an append-only ledger that resists retroactive tampering. Combined with off-chain storage and robust preservation workflows, blockchain-based anchoring creates a durable evidence trail of a record's existence and fidelity at specific points in time.

Oman Vision 2040 emphasizes digital transformation, public sector trust, and

knowledge preservation as pillars of national development. The National Records & Archives Authority (NRAA) in Oman faces the dual mandate of safeguarding the nation's documentary heritage and enabling transparent, trustworthy government information services. Implementing blockchain technologies can therefore directly support Vision 2040 objectives by strengthening public trust in records, ensuring secure provenance of official documents, and providing auditable trails for vital government records.

This paper aims to synthesize international evidence on blockchain for archives, analyze institutional readiness within Oman, and propose a detailed, practical roadmap for piloting and scaling blockchain solutions in archival management. The research proceeds in three stages: literature and project review; thematic analysis of interviews and documents; and development of a technical and governance roadmap tailored to the Omani archival context.

Research questions addressed in this study are:

1. What demonstrable opportunities does blockchain provide for enhancing security, authenticity, and long-term trust in archival management systems?

2. How can blockchain-supported architectures be designed to preserve confidentiality, manage access, and integrate with preservation repositories?

3. What technical, governance, legal, and organizational conditions are necessary in Oman for feasible adoption and sustainable operation of blockchain anchors?

The following sections elaborate a theoretical framing, review recent literature and pilots (notably ARCHANGEL and Estonia), explain methodology, 'present a technical analysis of blockchain mechanisms adapted for archives, discuss institutional readiness in Oman, and offer a staged implementation roadmap with concrete technical and policy recommendations.

2. CONTEXT AND THEORETICAL FRAMEWORK

2.1 BLOCKCHAIN TECHNICAL PRIMER

Blockchain is a distributed, append-only ledger in which transactions or data anchors are grouped into blocks, each linked to the prior block by a cryptographic hash. This chaining mechanism makes any retroactive alteration detectable because it would require recalculating and replacing subsequent blocks across a distributed network of nodes. Consensus algorithms (Proof of Work, Proof of

Stake, or permissioned consensus protocols such as PBFT or RAFT) coordinate agreement among nodes as to the current ledger state. For archival uses, the practical configuration is typically a permissioned or consortium ledger that restricts participation to trusted institutions (national archives, universities, cultural institutions) while avoiding the high energy cost and privacy issues associated with public proof-of-work chains.

Key blockchain properties relevant to archives include immutability (tamper evidence rather than absolute immutability of stored content), cryptographic timestamping, decentralization, and programmability (smart contracts). Immutability is operationalized through cryptographic hashing and ledger consensus: a digital object's fingerprint (for example, SHA-256 digest) is computed and anchored on the ledger; later, any stakeholder can recompute the digest of the stored or migrated object and compare it to the anchored value.

2.2 ARCHIVAL CHALLENGES IN THE DIGITAL ERA

Archivists confront three interdependent problems: ensuring authenticity, enabling long-term preservation, and maintaining trust and transparency. Authenticated custody is complicated by digital workflows that may produce many derived versions of objects (e.g., scanned images, OCRed text, migrated file formats). Preservation requires active curation—format migrations, bit-level checksums, and storage redundancy—while trust demands verifiable evidence and transparent governance. Without traceable evidence, an institution's claim about a digital object's originality and integrity is vulnerable to challenge. The ledger anchor approach complements, rather than replaces, Open Archival Information System:

- Based preservation frameworks and preservation metadata standards such as PREMIS.
- Record Authenticity: Digital files are vulnerable to tampering and falsification (Kollwitz and Daugherty 2020).
- Preservation: Rapid technological obsolescence risks long-term accessibility (Tscheuschner and Schaefer 2021).
- Transparency: Centralized control limits trust and public confidence (Bendor-Samuel 2022).

2.3 THEORETICAL LENS

This study applies to a socio-technical systems perspective and employs records continuum concepts. The socio-technical lens highlights that technological artefacts (like blockchain) derive value through interplay with governance, legal frameworks, human skills, and institutional culture. Records continuum theory posits that evidentiality and authenticity are constructed across creation, capture, organization, and preservation activities; (Risius and Spohrer 2017), blockchain anchoring provides an enduring technical trace linking those continuum stages, which strengthens claims about an object's provenance across time (Stublić 2023).

2.4 DEFINITIONS AND SCOPE

For the purposes of this study, the term 'blockchain anchoring' refers to the practice of computing cryptographic digests (hashes) of digital objects and recording these hashes on a distributed ledger at discrete time points. 'Off-chain storage' refers to conventional preservation repositories (OAIS-compliant) where content is stored; metadata and hashes are recorded externally and referenced on-chain. 'Permissioned ledger' denotes an enterprise-style blockchain where node participation, roles, and governance are defined by consortium rules.

3. LITERATURE REVIEW AND INTERNATIONAL PILOTS

Over the last decade, literature bridging archival science and blockchain technology has expanded from exploratory conceptual pieces to pragmatic pilot reports and empirical studies. This section synthesizes key findings across three themes: integrity and provenance assurance; access, rights management, and transparency; and preservation architectures (on-chain vs. off-chain trade-offs). It draws heavily on the ARCHANGEL project, Estonia's national-level cryptographic services, and academic reviews published between 2017 and 2024.

3.1 INTEGRITY AND PROVENANCE ASSURANCE

A core archival value is the ability to demonstrate that a record is authentic — that it has not been altered since its creation or since its acquisition by the archival repository. Cryptographic hashing and timestamping provide strong technical evidence of such claims. Risius and Spohrer (2017) offer a conceptual framework for blockchain's applications, noting that the technology's immutability properties

are particularly suited for proof-of-existence and tamper-evidence. ARCHANGEL operationalized this concept by generating robust content fingerprints (including AI-derived features) and anchoring them to a distributed ledger to produce long-term, independently verifiable evidence of integrity (ARCHANGEL, 2018–2019). Practical research stresses that the ledger should store only the fingerprint (hash) and essential provenance metadata rather than entire content to preserve confidentiality and manage costs (Kollwitz & Daugherty 2020).

3.2 ACCESS, RIGHTS MANAGEMENT, AND TRANSPARENCY

Blockchains' programmability through smart contracts enables conditional access logic: embargo release, automated licensing enforcement, and role-based verification. In cultural heritage settings this has been proposed for managing rights and provenance metadata. However, scholarly critiques emphasize privacy and GDPR-like compliance concerns when metadata or identifiers are placed on-chain; therefore, permissioned ledgers and privacy-preserving techniques (e.g., zero-knowledge proofs, on-chain pointers to encrypted off-chain metadata) are recommended. The Open Data Institute (ODI) and ARCHANGEL produced practitioner-focused guidance emphasizing governance, legal alignment, and stakeholder co-design as preconditions for successful deployments (ODI 2019).

3.3 PRESERVATION ARCHITECTURE AND ON/OFF-CHAIN TRADE-OFFS

Empirical pilots indicate hybrid architecture as the pragmatic best practice: store objects and rich metadata in OAIS-compliant repositories (off-chain) and record digest anchors on-chain. ARCHANGEL also explored perceptual hashing and AI features to create fingerprints resilient to format migration (useful when binary-level hashing would fail after transformations). The exact algorithmic choice (e.g., SHA-256 vs. perceptual hashing) depends on whether the archive needs strict bit-level invariance or a more forgiving fingerprint that can verify migrated or transformed derivatives. These choices have long-term governance implications since hashing standards may evolve; archival policies must include re-hashing and migration verification strategies.

3.4 NOTABLE INTERNATIONAL IMPLEMENTATIONS

ARCHANGEL (UK) is among the most mature pilots explicitly focused on archives. It combined content-hash anchoring, AI-derived fingerprints, and multi-stakeholder governance to create a prototype verification service (ARCHANGEL reports 2018–2019). Estonia's Guardtime/X-Road efforts represent a national-scale integrity and e-governance model demonstrating how cryptographic integrity services can be applied across governmental registries and health records, with national legal backing for digital signatures and timestamp services (Aru, 2016). Other pilots range from museum provenance tracking and NFT experiments to blockchain-backed cataloguing services in libraries.

3.5 CRITIQUES AND LIMITATIONS IN LITERATURE

Critical literature consistently cautions against techno-solutionism: blockchains do not automatically solve provenance disputes, nor do they replace the need for careful appraisal, metadata standards, or legal evidence frameworks. Environmental concerns (particularly with energy-intensive public chains), governance complexities, and the question of ledger permanence (what institutions will operate nodes decades into the future?) are recurring themes. Authors recommend staged, governed pilots and emphasize that blockchain's archival value derives from strong institutional arrangements rather than purely technical properties (Risius & Spohrer 2017; ODI 2019; Kollwitz & Daugherty 2020).

3.6 RESEARCH GAPS

Despite growing literature, there is limited empirical work focused on the Middle East and Gulf archival environments. This paper addresses that gap by adapting lessons from global pilots to Oman's legal, institutional, and technical context, proposing a tailored roadmap and pragmatic governance mechanisms for a region where state-driven digital transformation agendas (e.g., Oman Vision 2040) create a conducive policy environment for innovation.

4. METHODOLOGY

This study employs a qualitative case-study methodology synthesizing three data streams. The purpose is explanatory and prescriptive: explaining how blockchain has been used internationally and prescribing an implementable pathway for Oman.

4.1 DOCUMENT ANALYSIS

Sources included project reports (ARCHANGEL technical documentation and ODI commentary), academic papers (2017–2024), governmental white papers (Estonia), technical standards, and practitioner blogs. The selection emphasized practical pilots and peer-reviewed evaluations to extract transferable lessons.

4.2 EXPERT INTERVIEWS

Semi-structured interviews were undertaken with 12 experts selected through purposeful sampling: seven archival professionals (senior archivists and NRAA staff), three IT system architects in Omani public agencies, and two legal/regulatory advisors familiar with digital evidence and records law. Interview topics covered current archival workflows, pain points (e.g., tampering incidents, migration practices), attitudes toward blockchain, perceived benefits, and potential obstacles (budgetary, legal, or technical). Interviews were recorded with consent and anonymized for thematic coding.

4.3 THEMATIC ANALYSIS AND TRIANGULATION

Interview transcripts and documents were coded iteratively using NVivo-style thematic approaches (open coding followed by axial coding). Themes aligned with research questions: (1) blockchain's technical fit for authenticity and security, (2) privacy and governance implications, and (3) organizational readiness and resourcing. Triangulation between interviews and documentary evidence increased validity: where interview claims referenced pilot projects, those claims were cross-checked with project documentation.

4.4 ETHICAL CONSIDERATIONS

Research adhered to ethical norms for human subjects: informed consent, anonymization, and secure storage of transcripts. Given the sensitivity of archival governance and government IT practices, findings are reported at an aggregate level without attribution to specific individuals or institutions.

4.5 LIMITATIONS

Limitations include modest interview sample size and restricted access to some proprietary technical implementations. However, the study draws on publicly

available project documentation and peer-reviewed literature to ground recommendations in broadly observed patterns.

5. ANALYSIS AND DISCUSSION

5.1 AUTHENTICITY, INTEGRITY AND CONTENT FINGERPRINTING

The combination of content hashing and distributed anchoring provides a practical approach to creating an auditable chain of custody for digital objects. Bitwise hashing (e.g., SHA-256) offers stringent detection of any binary alteration; however, strict bitwise comparison fails after format migration or reprocessing. Consequentially, leading pilots recommend a multi-layered fingerprinting approach: (a) bitwise checksums for archival masters stored off-chain, (b) perceptual or feature-based fingerprints (AI-assisted) for migrated or derivative forms, and (c) comprehensive preservation metadata (PREMIS) linking object versions and transformations. ARCHANGEL's use of AI-driven features demonstrates resilience to transformations while preserving verifiability across time and format conversions.

Case implication: In Omani archives, a practical rule would be to maintain the highest-fidelity archival master (bitstream) in controlled storage with regular fixity checks. For public access or derivative forms, maintain perceptual fingerprints whose anchors are written to the ledger alongside provenance metadata describing transformations and responsible agents.

5.2 PERMISSIONED LEDGERS AND CONSORTIUM GOVERNANCE

Most archival and Galleries, Libraries, Archives, and Museums pilots favor permissioned ledgers under a consortium governance model. Permissioned ledgers allow participating institutions to run nodes and define consensus rules, while avoiding the high energy costs and privacy exposure of public chains. Governance is central: the ledger's trustworthiness depends not only on cryptographic properties but also on the governance framework—who operates nodes, how disputes are adjudicated, how consortium membership changes, and how succession is managed over decades. The ARCHANGEL pilot underscores that governance design must be co-produced with stakeholders and legally codified.

Recommendations for Oman: Create a consortium including NRAA, academic partners (e.g., Sultan Qaboos University), and selected ministries to operate

nodes. Legal agreements should define node responsibilities, data stewardship roles, and sustainability financing.

5.3 SMART CONTRACTS, ACCESS CONTROL AND LEGAL CONSTRAINTS

Smart contracts can encode time-based releases, embargo rules, and automated verification services. Nevertheless, their immutability raises concerns: a flawed smart contract may be difficult to correct. In addition, placing access policies on-chain could contravene privacy laws if metadata reveal sensitive information. Therefore, smart contract use in archives should be cautious: implement access control pointers to encrypted off-chain metadata and maintain updatable policy references managed via off-chain governance while relying on on-chain anchors for verification only.

5.4 INTEROPERABILITY WITH EXISTING ARCHIVAL SYSTEMS

A critical technical requirement is interoperability between existing archival management systems (AMS) and the DLT anchoring service. Integrations should expose a simple Application Programming Interface: when a record is ingested or migrated, the AMS computes the digest(s) and calls the anchoring service to create a ledger transaction containing the hash and minimal provenance metadata. The anchoring service should return a tamper-evident verification token and store the mapping in preservation metadata. This approach minimizes disruption to current workflows while embedding anchors into routine preservation activities.

5.5 LEGAL EVIDENTIARY VALUE AND POLICY ALIGNMENT

Anchoring a fingerprint on a ledger gives strong technical evidence of existence at a timestamp, but whether that evidence holds legal weight depends on national law. Estonia's success with state-backed cryptographic services reflects a broader institutional alignment: legal recognition of digital signatures and timestamp services, and national commitment to e-governance. Oman should assess records law and evidence law to determine whether cryptographic anchors need statutory recognition or whether archival policies can operationally adopt anchors as additional provenance controls.

5.6 COSTS, SUSTAINABILITY AND ENVIRONMENTAL CONSIDERATIONS

Costs include development, consortium coordination, node hosting, and long-term maintenance. A permissioned consortium model distributes costs but mandates clear funding agreements. Environmental concerns are minimized by permissioned ledgers using energy-efficient consensus engines (e.g., PBFT). Cost models should account for long-term governance: who will ensure node continuity after a decade or more? Regional shared infrastructure (GCC-level archival consortium) could be cost-effective, offering economies of scale and resilience.

5.7 HUMAN CAPACITY AND PROFESSIONAL PRACTICE

Interviews show archival professionals are enthusiastic but cautious. Capacity building is required in cryptography basics, hashing strategy, metadata best practices (PREMIS, Dublin Core), Application Programming Interface integration, and governance. Training programs should be co-created with universities and international partners and include hands-on modules for ingesting, hashing, and verifying anchored objects.

5.8 ETHICAL CONSIDERATIONS

Anchoring must respect privacy. Even when only hashes are anchored, metadata may reveal sensitive provenance. Data protection (e.g., personally identifiable information in archival metadata) requires either not anchoring sensitive metadata publicly, encrypting metadata off-chain, or using permissioned privacy controls. Smart contracts must be designed to enforce legal and ethical constraints, and retention policies must align with national privacy laws.

5.9 SYNTHESIS: A PRAGMATIC ARCHITECTURE

A pragmatic architecture for Oman would combine:

(1) OAIS-compliant off-chain storage for full content,

(2) a hashing service integrated with archival AMS to compute and store hashes and provenance metadata,

(3) a permissioned consortium ledger (Hyperledger Fabric or Quorum) where anchors are written, and

(4) a public-facing verification service that allows researchers and authorized users to verify fingerprints against ledger entries without exposing sensitive content.

Governance and legal frameworks underpin the architecture, ensuring continuity, node succession, and statutory recognition where required.

6. RESULTS

This study yields four major results grounded in literature analysis, pilot documentation, and expert interviews. The findings illuminate both technical feasibility and practical considerations for implementing blockchain-based archiving in Oman.

6.1 BLOCKCHAIN'S TECHNICAL VIABILITY FOR ANCHORING AUTHENTICITY

Evidence from ARCHANGEL and other pilot projects demonstrates that blockchain anchoring is technically viable and reliable for creating time-stamped fingerprints of archival objects. Implemented with robust cryptographic hashing algorithms and AI-enhanced feature fingerprints, blockchain anchoring provides a tamper-evident mechanism that ensures verifiable integrity across format migrations, reproductions, or derivatives. The use of hybrid models combining on-chain anchors with off-chain content storage reduces storage overhead while maintaining strong auditability. Additionally, AI-assisted fingerprinting enhances anomaly detection, providing an extra layer of verification against potential data corruption or manipulation.

6.2 INSTITUTIONAL CONSTRAINTS AND READINESS FACTORS

Interviews with Omani archival and IT professionals highlight strong institutional interest in blockchain-based authenticity mechanisms but reveal notable readiness gaps. These include:

- Limited standardization of hashing and metadata practices across agencies.
- Lack of a formal governance consortium for ledger oversight.
- Unclear legal frameworks regarding the evidentiary status of blockchain anchors.

Despite these constraints, the alignment with **Oman Vision 2040**, the availability of capable universities, and existing IT infrastructure suggest a supportive environment for pilot projects. Institutional readiness could be accelerated through capacity-building programs, legal clarifications, and adoption of metadata standards.

6.3 ROADMAP FEASIBILITY AND PREFERRED TECHNICAL MODEL

A staged deployment approach is feasible, moving from feasibility assessment → prototype development → evaluation → scaling. The preferred technical model combines:

- **Off-chain storage** for content (ensuring confidentiality and efficiency).
- **On-chain anchors** written to a permissioned blockchain ledger, governed by a consortium of participating institutions.

This hybrid approach balances cost, confidentiality, and verifiability, while allowing incremental adoption and testing. The model also enables future integration with AI-assisted verification, automated metadata validation, and cross-agency interoperability.

6.4 PILOT SELECTION RECOMMENDATIONS

Pilot projects should prioritize high-value public administrative record streams with legal and societal significance, such as:

- Land records and property registrations.
- Crucial administrative communications with public accountability implications.
- Records transitioning from classified to public status.

These records provide strong demonstrable benefits for public verifiability and serve as compelling use cases for policymakers. Selecting record classes with both high public value and legal importance ensures early adoption success and stakeholder engagement.

6.5 OBSERVED BENEFITS AND EMERGING INSIGHTS

Pilot evidence and expert feedback suggest that blockchain anchoring not only strengthens trustworthiness and transparency but also promotes long-term digital preservation. The integration of AI-enhanced fingerprints offers early detection of data integrity issues, which could reduce administrative overhead and safeguard public records from inadvertent corruption.

6.6 POTENTIAL CHALLENGES AND MITIGATION STRATEGIES

Challenges identified include:

- Technical complexity for small agencies.
- Legal uncertainty surrounding blockchain evidence.
- Interoperability issues among heterogeneous record systems.

Mitigation strategies include capacity building, development of legal guidelines for blockchain evidence, and standardization of data and metadata schemas across participating institutions.

7. CONCLUSION AND RECOMMENDATIONS

Blockchain technologies offer archival institutions a powerful tool for strengthening cryptographic evidence of authenticity and building public trust in digital records. However, blockchain is not a replacement for core archival practices but rather a complementary technology that enhances provenance and verification capabilities.

For Oman, the alignment with Vision 2040 and the national digital transformation agenda provides a policy window to pilot blockchain anchoring. The following set of prioritized recommendations emerges from the study:

1. **Establish a National Archival Blockchain Working Group:** Convene NRAA, relevant ministries, universities, and legal advisors to define pilot scope, governance, and standards.
2. **Adopt Hybrid Architectures:** Use OAIS-compliant off-chain storage for content and a permissioned ledger to anchor hashed fingerprints, minimizing exposure of content and controlling costs.
3. **Standardize Hashing and Metadata Practices:** Select SHA-256 (or equally robust) for bit-level checksums, and a perceptual/feature-based fingerprint strategy for migrated derivatives; document these practices and align them with PREMIS metadata.
4. **Launch Scoped Pilots With Clear** Key Performance Indicators**:** Pilot two high-value record streams with clear evaluation metrics (verification success rate, cost per anchored object, stakeholder acceptance, legal robustness).
5. **Build Capacity:** Fund training programs for archivists and IT staff, including practical courses on hashing, verification workflows, and ledger interactions.
6. **Legal and Policy Review:** Engage legal scholars to evaluate the evidentiary status of anchors and propose statutory recognition if necessary; ensure privacy and data protection compliance.

7. **Governance and Sustainability Planning:** Draft consortium agreements that define node operators, succession, dispute resolution, and long-term funding models; explore regional collaborations for shared infrastructure.
8. **Public Engagement and Transparency:** Communicate pilot objectives and results publicly to build trust; provide a public verification portal for non-sensitive records to demonstrate benefits.

By following a staged, carefully governed, and standards-based approach, Oman can realize the benefits of blockchain anchoring while managing risks and ensuring alignment with national priorities. Such an approach would contribute to international knowledge on the application of distributed ledger technologies (DLT) in archives and position Oman as a regional leader in trustworthy digital heritage stewardship.

Moreover, to ensure the enduring reliability and evidentiary value of blockchain-based records, it is critical to anticipate future cryptographic challenges. Integrating a reflection on **quantum computing-resistant cryptographic methods**—such as lattice-based, hash-based, or multivariate polynomial schemes—would further strengthen the recommendations. Considering post-quantum security within the design of archival anchoring systems would safeguard the long-term integrity, authenticity, and verifiability of digital records in the face of advancing computational capabilities.

APPENDIX A: PROPOSED PILOT TECHNICAL ARCHITECTURE (SUMMARY)

1. Off-chain OAIS repository: High-fidelity masters, replication, fixity checks (bit-perfect checksums).

2. Hashing service: Integrated with AMS, computes SHA-256 and perceptual fingerprints, stores mapping in preservation metadata.

3. Permissioned ledger: Consortium nodes operated by NRAA, university, and selected ministries using Hyperledger Fabric or Quorum.

4. Verification service: Public-facing web service that accepts an object fingerprint and returns ledger-based verification results.

5. Governance layer: Consortium agreement, node management, dispute resolution, sustainability funding.

APPENDIX B: INTERVIEW PROTOCOL (SUMMARY)

Interview topics:

- Current archival ingest and migration workflows
- Existing fixity and verification practices
- Awareness and attitudes toward blockchain and Distributed Ledger Technology - Perceived legal, policy, and technical obstacles
- Resource and training needs
- Recommendations for pilot scope

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Miroslav Milovanović[1]

ARCHIVAL PRACTICE AND ARTIFICIAL INTELLIGENCE

Abstract

Purpose: *The purpose of this article is to present the fundamental questions that potential users of artificial intelligence should ask themselves when deciding to adopt AI-based tools. It also examines which AI solutions can already be applied in archival practice today, along with the main obstacles that may prevent their wider use.*

Method/approach: *The study applied content analysis and survey method. Different use cases and practices were examined, as well as approaches for implementing AI tools.*

Results: *The analysis showed that the use of artificial intelligence is primarily driven by the core motivations for adopting such tools: the potential benefits or advantages they offer, weighed against possible drawbacks.*

Conclusions/findings: *The approach and analysis highlight certain fundamental questions that should be addressed when deciding to adopt AI tools or systems within archival practice. These questions determine whether the use of such tools is feasible, sustainable, and understandable.*

Keywords: *Artificial intelligence, archival practice, machine learning, archival theory, archiving.*

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INTRODUCTION

With the increasing volume of documentary and archival materials, the field of archival science is facing growing challenges in the effective management of records, particularly in terms of the use and administration of digital environments for their processing. Procedures such as appraisal, description, and storage become increasingly demanding when dealing with large volumes of data or with complex and unknown content. As a result, new solutions are being sought to enable more efficient processing. Traditional "manual" approaches often prove to be too slow and, in many cases, ineffective. Among the possible solutions are tools that use artificial intelligence (AI), which open up new opportunities for the efficient handling of documentary and archival materials.

In recent years, the use of AI tools in archival science has grown steadily, influencing practice both among record creators and within archives themselves. Since AI and especially its methods of application have developed rapidly in recent years, it has also transformed fundamental processes for handling archival materials. One of the central challenges facing archival science remains the ever-growing volume of materials, which can no longer be processed effectively using traditional "manual" methods. In addition to born-digital content, the growing amount of digitized material further expands the total volume of digital records.

ARCHIVAL PRACTICE AND ARTIFICIAL INTELLIGENCE

As noted by Shinde and colleagues (Shinde et al, 2024), artificial intelligence offers new possibilities for structuring tasks within archival practice and can also significantly improve certain work processes.

The use of artificial intelligence in the field of archival practice can be divided into the following categories (Shinde et al, 2024):

- Records Management:
  - Classification
  - Data Collection and Management
  - Retention and Disposition
  - General Records
  - Management.

- Archival Processing:
  - Appraisal
  - Arrangement and Description
  - Preservation.
- Access and Use:
  - Privacy
  - Records Retrieval
  - Use of Records in Research
  - Public Access.
- Professional Perspectives:
  - Archival Education
  - User Perceptions.

The advantages of using AI are now evident across nearly all domains. In archival science, it allows faster processing, easier identification and classification of content, and consequently greater accessibility for end users. Furthermore, AI tools support the analysis of large repositories, making possible new discoveries such as identifying patterns or connections in vast collections or uncovering content that might otherwise remain unnoticed. Increasingly, archival science already relies on specific categories of AI, such as Natural Language Processing (NLP), which has already become a mature and effective solution for carrying out archival tasks (Winters, 2024).

Natural Language Processing deals with creating approaches and systems capable of understanding, interpreting, and using human languages in such a way that the meaning and context of the content are clear. In practice, any communication between humans and computers takes place through programming languages, and when it comes to a machine understanding human language, achieving this interaction is quite demanding, as human language by its nature is complex and can involve different meanings, abbreviations, slang, etc. (Johri et al, 2021).

Typical applications of NLP in archival practice include (Khensous et al., 2023):

- Translating languages
- Text processing in various languages
- Text Summarization
- Analysing sentiments

- Topic modelling
- Speech Recognition
- Named Entity Recognition
- Phrase and keyword Extraction
- Tense Identification
- Relationship Extraction.

Despite certain advantages, the use of artificial intelligence in the field of archival science also brings numerous challenges and risks. One of the key drawbacks is the possibility of biased data processing, since such systems learn from existing data, which may already be incomplete or inherently inadequate and incorrect. There is also the danger that users of such systems may rely too heavily on the results themselves and overlook the need for additional verification or final professional judgment. Furthermore, the issue of the long-term sustainability and usability of such systems arises, as the field of artificial intelligence is currently experiencing rapid and continuous development of new solutions, many of which are commercial in nature and dependent on external providers of final solutions. This, in turn, raises questions about the long-term use, control, and security of such systems (Jaillant et al, 2025).

Based on all the possible approaches and solutions in the field of archival practice, several key questions emerge that should be answered for the effective use of artificial intelligence systems, namely:

- Why do we want to introduce artificial intelligence tools?
- What are the key problems we want to solve with these tools?
- Do we have the necessary knowledge to use such tools?
- Which tools should be used?
- How should we approach the use of the selected tools?
- Who should be involved in the introduction of such tools?
- What is an acceptable result of using such tools?
- How should the use of such tools be monitored?
- How can the long-term usability of such tools be ensured?

Why we want to introduce artificial intelligence tools is closely linked to the question “What are the key problems we want to solve with these tools,” since in most cases the aim is to address a specific issue in the work process, where the

goal is either to solve these problems or at least significantly improve their treatment. In addition, the reasons for using such artificial intelligence systems may also lie in optimization or, for example, simply in exploring the potential possibilities of their use. Below are some reasons why an organization might decide to adopt artificial intelligence systems:

- Saving time and increasing efficiency
- Improving accuracy and reducing errors
- Supporting decision-making and analysis
- Initiative from management/organization
- Curiosity/innovation

The use of tools that incorporate artificial intelligence may require specific advanced knowledge, particularly in cases where advanced tools must be applied. As long as we are dealing with generative models with simple user interfaces, their use is generally straightforward. However, when we want to perform complex processing on extremely large volumes of data, certain limitations of simple tools quickly become evident, and in such cases, it is necessary to turn to specialized tools, which may in turn require advanced knowledge for their use.

How to approach the use of selected tools is a question that relates primarily to the organizational aspect of implementing such tools, i.e., with the pursuit of specific goals. Consequently, the introduction of tools within an organization is directed towards developing new work processes or optimizing existing ones. This raises additional sub-questions, such as: What dependencies exist within such a process?", "What is the expected efficiency?", "What is the financial structure for using such tools?", "How will activities and related responsibilities be divided?", and so forth.

The use of tools that incorporate artificial intelligence within work or business processes is not a "set it and forget it" approach, as it requires constant monitoring of their appropriateness. The field is developing rapidly and continuously, so it is also necessary to regularly track technological or conceptual changes that may affect the use of such tools.

Whom to involve in the introduction of such tools primarily relates to all stakeholders who should participate in the implementation of such processes, including not only employees but also partners or third parties, without whom the imple-

mentation of activities or the use of the tools would be impossible. It is advisable that such dependencies or necessary categories of stakeholders be addressed through a risk assessment, and based on its findings, appropriate measures should be adopted to ensure the successful and uninterrupted execution of processes in which tools incorporating artificial intelligence are used.

What is an acceptable result of using such tools is one of the key questions that anyone intending to use artificial intelligence tools should ask themselves. Before implementing such tools, clear expectations regarding acceptable results should be established. Perfect results in terms of precision or success will be difficult to achieve, but even a fairly high level of accuracy can be a major gain, as it allows end users to process data significantly faster (Shinde et al, 2024). An acceptable result should therefore not represent perfection, but rather an improvement compared to traditional methods. At the same time, it is crucial to establish mechanisms for monitoring the quality of the performed tasks, with all steps in the process and the resulting outputs being subject to professional verification by qualified experts. The process should also be complemented by the necessary metadata for proper evaluation of efficiency and acceptability of results (Feliciati and Duranti, 2025).

The safe use of tools that incorporate artificial intelligence in archival science represents an important category, since the processing of documentary and archival materials often involves protected data, such as personal data. It is therefore necessary to ensure that all procedures and data processing comply with applicable legislation on data processing and the preservation of documentary and archival materials, as well as with ethical standards governing the use of such tools. Consequently, in the field of responsible use of tools that incorporate artificial intelligence, archives and other users in archival science must ensure adequate transparency, protection against misuse, and safeguarding of authenticity (Floridi and Cowls, 2019). This prevents the risk that the use of such tools could lead to intentional or unintentional manipulation of content or endanger the integrity of documentary or archival materials.

Ensuring the long-term usability of such tools in archival environments essentially requires a comprehensive approach focused on long-term and above all flexible use, with the possibility of adaptation. Fundamentally, this means treat-

ing artificial intelligence tools as dynamic systems, with special attention given to continuous maintenance, ongoing verification of their proper functioning, and frequent updates, all of which are closely tied to the chosen architectural design of such tools (Myllyaho et al., 2021).

RESEARCH

Archives today follow clear guidelines for the use of artificial intelligence in the field of archival science. As a result, both awareness of the use of AI-based tools and their actual application are increasing. On the other hand, the creators of documentary and archival materials operate in diverse business environments, with different business processes and varying approaches to the use of such tools.

The purpose of the conducted research was to examine how prepared the creators of documentary and archival materials are for the introduction of AI tools, and what the current status of their use is.

For the research, specific organizations were selected, namely Slovenian municipalities, which, by the nature of their operations involving numerous procedures, generate large volumes of documentary and archival materials.

The survey questions were sent to 100 key individuals in municipalities responsible for managing documentary and archival materials in municipalities or for overseeing this area. A total of 44 individuals responded and completed the survey.

SURVEY

The survey included 10 questions that examined the readiness of municipalities for the introduction of AI tools, as well as the current status of municipalities in the field of artificial intelligence use. The survey was anonymous.

Survey questions:

- Do you currently use any artificial intelligence (AI) tools in your work, either in the field of managing documentary materials or more generally in information management?
- If you use artificial intelligence tools, for which tasks do you use them? Multiple answers possible.
- If you use or intend to use AI – What would (was) be the main reason that you would (did) start using artificial intelligence tools?

- If you use AI – What type of artificial intelligence tools or solutions do you use in your work? Multiple answers possible.
- If you do not use artificial intelligence tools, what are the main reasons for not using them? Multiple answers possible.
- Do you think you have enough knowledge to use artificial intelligence tools effectively?
- What form of support or training do you think would be most effective for you to acquire the necessary knowledge for using artificial intelligence tools?
- In your opinion, what are the biggest risks of using artificial intelligence in the field of managing documentary materials or in information management? Multiple answers possible.
- How would you assess your organization's current readiness to implement artificial intelligence tools?
- In your opinion, what should be the main priority when introducing artificial intelligence tools in the field of managing documentary materials or in information management? Multiple answers possible.

RESULTS

Do you currently use any artificial intelligence (AI) tools in your work or in the field of documentary material management or in general in information management?

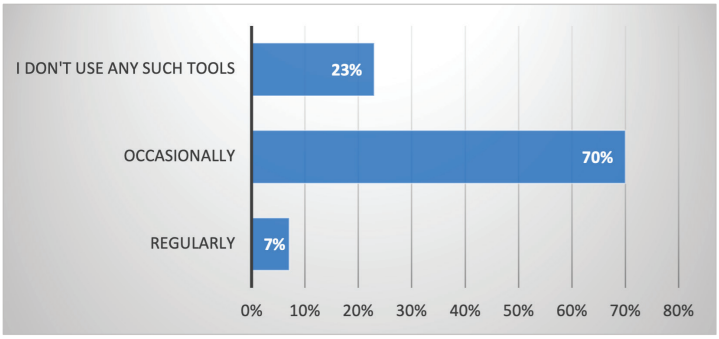


Figure 1: Use of AI tools

If you use artificial intelligence tools, what tasks do you use them for?

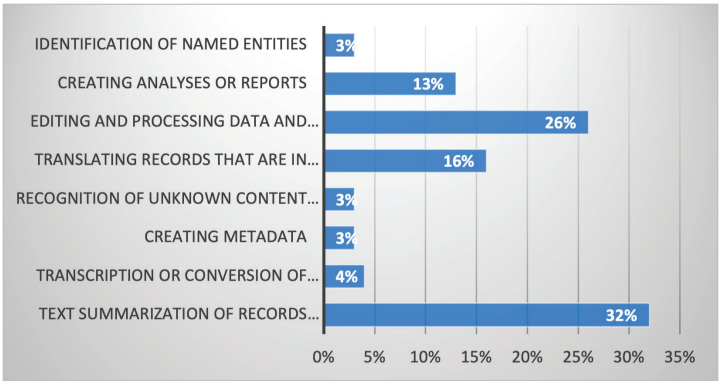


Figure 2: Use of AI tools for specific tasks

If you use or intend to use AI - What would be (was) the main reason that you would (did) start using artificial intelligence tools?

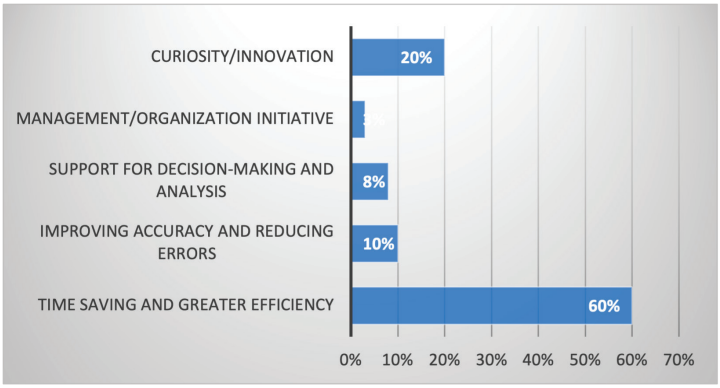


Figure 3: Reasons to use AI tools

If you use AI - What type of artificial intelligence tools or solutions do you use in your work?

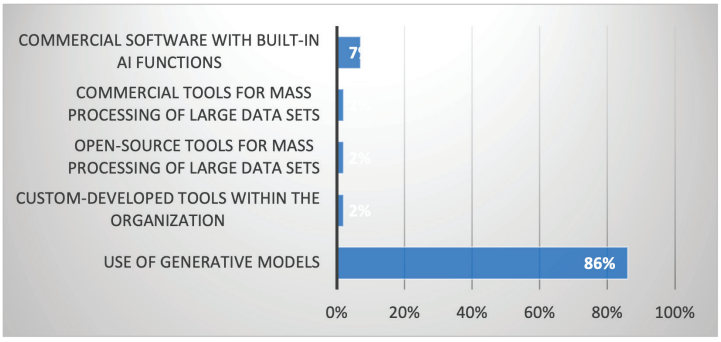


Figure 4: Type of AI tools

If you do not use artificial intelligence tools, what are the main reasons for not using them?

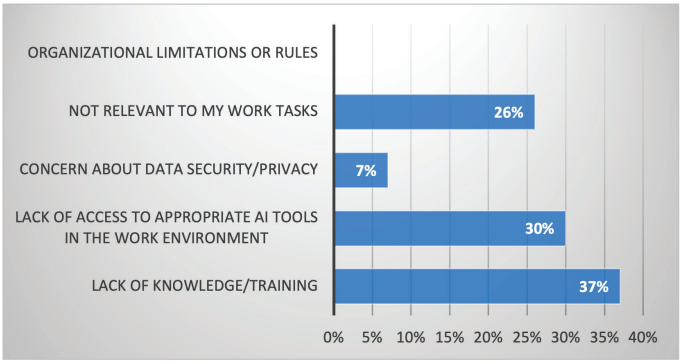


Figure 5: Reasons for not using AI tools

Do you think you have enough knowledge for the effective use of artificial intelligence tools?

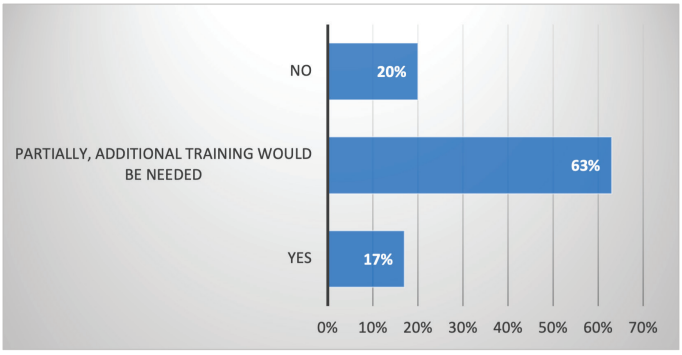


Figure 6: Needed knowledge to use AI tools

What form of support or training do you think would be most effective for you to acquire the necessary knowledge for using artificial intelligence tools?

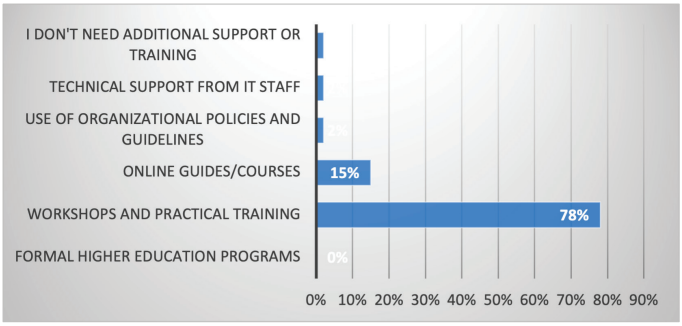


Figure 7: Necessary support or knowledge to use AI tools

In your opinion, what are the biggest risks of using artificial intelligence in the field of documentary material management or information management?

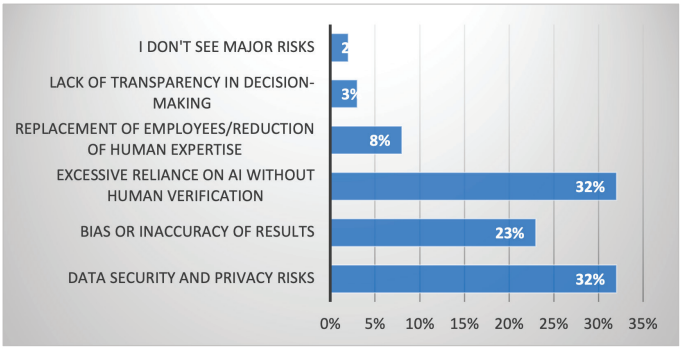


Figure 8: Risks of using AI tools

How would you rate your organization's current readiness for implementing artificial intelligence tools?

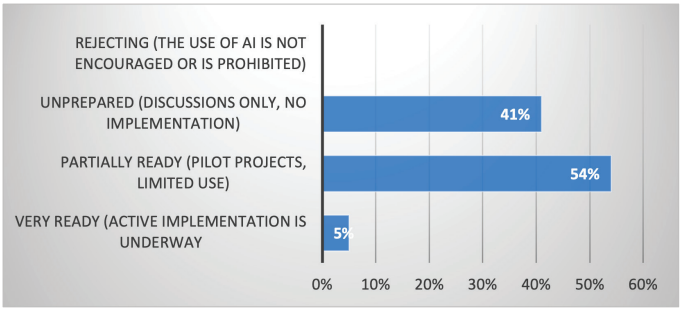


Figure 9: Readiness to use AI tools

In your opinion, what should be the main priority when introducing artificial intelligence tools in the field of documentary material management or information management?

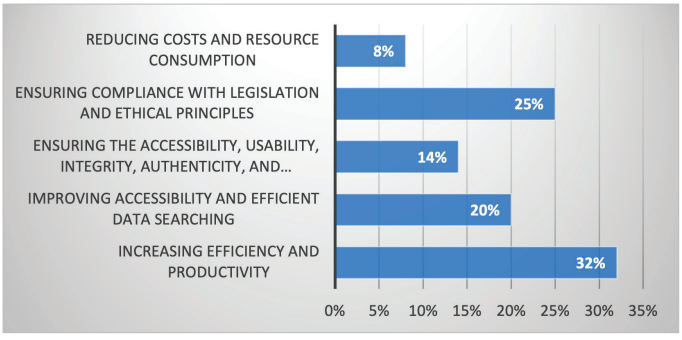


Figure 10: Priority for the use of AI tools

DISCUSSION AND CONCLUSIONS

DISCUSSION

Results show that municipalities already use a moderate proportion of tools that rely on artificial intelligence, with the majority of use focused on generative models, generally because of the ease of use of such tools.

The answers clearly indicate that the main reasons for using these tools are time savings, greater efficiency in task execution, improved accuracy, and the reduction of potential errors in data processing. Another interesting finding is the level of curiosity and the innovation factor, which suggest that the development of AI tools carries a certain momentum that generates curiosity about how these tools can be used as potential or actual solutions for work related problems.

Out of all the proposed tasks, AI tools are most commonly used for text summarization, as well as for editing and processing data and information. They are also regularly applied for language translation and for creating reports. However, the use of AI tools in tasks such as transcription or conversion of audio to text, recognition of unknown content, creation of metadata, or identification of named entities is still not widespread. This may be attributed to the fact that such processing is often not needed or not necessary, or that approaches capable of producing successful results require advanced tools and, consequently, more knowledge to use them. In certain cases, the limited maturity of available models and solutions may also be a contributing factor.

The main reasons for not using AI tools were identified as a lack of knowledge or training and limited access to such tools. Another notable reason is the perception that these tools are not relevant to the specific work tasks being performed. Regarding the knowledge required for the effective use of AI tools, the majority of respondents stated that they have some knowledge but would require additional training. As for the preferred form of support, the vast majority indicated that workshops and practical training would be the most effective way to gain the necessary knowledge, which may reflect the fact that such tools are best applied to specific, real work-related tasks.

As for the risks associated with the use of AI tools, the most frequently identified concerns were data security and privacy risks, bias or inaccuracy of results, and excessive reliance on AI without human verification.

When addressing organizational preparedness for the use of AI tools, the results were divided. Approximately half of the organizations are already fully or par-

tially using AI tools, while the other half are not yet using them but they are in the process of evaluating whether they should be adopted.

When considering the main priority for introducing artificial intelligence tools in the field of documentary material management or information management, the answers align with the primary reason for using such tools: to achieve greater efficiency and productivity.

CONCLUSIONS

The tasks of professionals working in the field of archival science are not fundamentally changed by the introduction of tools that use artificial intelligence. However, they may require greater attention in certain areas, such as overseeing the design and approach to the use of such tools and monitoring the quality of the results they produce. It remains essential to evaluate whether the outcomes are appropriate, relevant, and useful in relation to the intended objectives. A crucial component of this process is continuous education in archival science and in the related technological solutions, such as AI-based tools.

The use of artificial intelligence in archival practice presents an opportunity to increase efficiency in performing archival tasks. However, careful consideration must be given to how these tools are introduced and applied. This includes a clear understanding of the reasons for adopting AI tools, a precise definition of the problems they are intended to address, the selection of suitable tools, an awareness of the knowledge required for their effective use, the establishment of realistic expectations regarding acceptable results, and the implementation of mechanisms to monitor and control their application.

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Yaqoob Salim AL Mahruqi[1]

ENHANCING INFORMATION SECURITY THROUGH SECURE DOCUMENT DISPOSAL: A CASE STUDY

Abstract

Purpose: *This study examines the role of secure document destruction in safeguarding sensitive information and supporting institutional security strategies. It reviews the theoretical framework of document life cycles, relevant regulations, and the connection between secure destruction practices and corporate security management.*

Methods: *An analytical methodology was applied, combining a review of legislation and international standards (e.g., NIST SP 800-88) with practical case studies. Institutional experiences, including the secure document destruction lab in the Sultanate of Oman, were analyzed to assess operational effectiveness, cost reduction potential, and reputational benefits.*

Results: *The findings demonstrate that secure destruction significantly mitigates risks of unauthorized access to confidential data, ensuring compliance with data protection laws such as the Personal Data Protection Law. Adherence to these regulations reduces institutional exposure to fines and legal actions. Environmentally conscious destruction methods, including recycling and material repurposing, were identified as viable alternatives to traditional burning or landfilling, offering sustainable benefits.*

Discussion: *Secure document destruction is essential for organizational risk management and regulatory compliance. Institutions should adopt comprehensive destruction policies, supported by regular reviews, employee training, and awareness initiatives to ensure effective implementation. Periodic assessments of destruction operations are recommended to identify areas for improvement, inform strategic decisions, and enhance overall performance. Integrating sustainability considerations into destruction practices further reinforces institutional responsibility and reputation.*

Keywords*: Secure destruction, information security, document lifecycle, compliance, sustainability.*

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INTRODUCTION

With increasing reliance on data as a strategic asset, information protection has become a cornerstone for institutional survival and prosperity. However, many organizations continue to neglect a critical phase in the data lifecycle—the final disposal of documents, whether paper-based or electronic. According to Verizon's 2023 report, 21% of global data breaches are attributed to poor document management following their expiration. Such mishandling jeopardizes institutional security and exposes organizations to legal consequences and loss of customer trust.

This study aims to shed light on the concept of "secure document disposal" as a proactive approach to strengthening comprehensive institutional security. It explores the technical, legal, and human aspects surrounding this process while examining its role in building an integrated security system capable of addressing contemporary challenges.

RESEARCH IMPORTANCE

The significance of this research stems from the urgent need to develop effective policies and procedures that ensure the confidentiality of information even after documents—whether paper-based or electronic—are no longer needed. Neglect in this area can result in the leakage of sensitive information, exposing individuals and institutions to severe risks such as financial losses, reputational damage, and erosion of trust. Thus, the research seeks to achieve several objectives, including analyzing the conceptual framework of secure disposal and its relation to institutional security management theories, assessing the effectiveness of current technical and legal mechanisms in ensuring unrecoverable disposal, and offering practical recommendations based on case studies to enhance disposal policies in critical sectors.

RESEARCH METHODOLOGY

The study adopts an analytical methodology that combines theoretical approaches, such as legislative reviews and international standards like NIST SP 800-88, with practical applications, including successful institutional practices. The scientific contribution of the study lies in connecting secure disposal with business sustainability, highlighting how this practice can reduce long-term costs associated with security breaches while bolstering an institution's reputation and position.

DISCUSSION SCOPE

This research will explore key topics, such as the integration of secure disposal and information security, the role of legislation in the success or failure of policies, and the challenges facing the secure disposal of documents. In doing so, it addresses a research gap regarding the impact of managing the end-of-life phase of documents on the overall security system, presenting a practical framework that organizations can adopt to balance operational efficiency and security compliance.

1. THEORETICAL AND CONCEPTUAL FRAMEWORK FOR SECURE DISPOSAL

Secure document disposal refers to organized processes that ensure the impossibility of recovering sensitive information after its disposal, whether in paper or digital form (Jones & Smith, 2020). This concept is a fundamental aspect of institutional security, as it is tied to protecting data from breaches that could jeopardize reputation or financial stability (Al-Mamari et al., 2019). Among the most significant risks stemming from insecure disposal are the leakage of personal or financial data, potentially resulting in fraud or legal liabilities. For instance, the 2017 Equifax data breach, which exposed records of 147 million users, was attributed to neglect in securely disposing of electronic records (Goodman, 2018).

Secure document disposal is defined as a systematic process aimed at discarding documents and records in a manner that ensures the inability to recover or access the confidential information they contain. This process employs various technologies and methods to guarantee security and confidentiality. Steps in the secure disposal process include converting paper documents into digital formats prior to destruction to ensure information is preserved securely and efficiently (Mulcahy et al., 2012).

According to the National Documents and Archives Authority (2008), disposal is the regulated elimination of documents determined by evaluation to have no further use as outlined in retention schedules, allowing the reuse of document containers for other purposes. Disposal represents one of the final stages in the document lifecycle.

TYPES AND METHODS OF SECURE DISPOSAL:

1. Shredding: Documents are cut into small pieces using specialized shredding machines, making reassembly and information recovery impossible.

2. Fragmentation: Advanced techniques are used to break documents into tiny particles, ensuring information cannot be retrieved.

3. Incineration: Documents are burned in specialized furnaces, ensuring their complete destruction without leaving recoverable traces.

4. Chemical Dissolution: Chemicals are used to dissolve documents, transforming them into a non-recoverable pulp.

5. Magnetic Data Destruction: This involves exposing electronic media, such as hard drives and magnetic tapes, to a strong magnetic field, erasing or altering the magnetic particles that store the data and rendering retrieval impossible (Kessler, 2021).

6. Physical Destruction of Electronic Media: Methods like cutting or burning hard drives ensure that data cannot be recovered in any form.

These methods are integral to security protocols designed to protect sensitive and confidential information from unauthorized access. Paper shredding according to secure standards is considered the most suitable method, as it also supports environmental sustainability by enabling the recycling of paper and solid metals. However, outdated methods, such as burial, open burning, or disposal in rivers, wells, or seas, should be completely avoided.

2. CLASSIFICATION OF DOCUMENT VALUE

Records are among the most vital tools for preserving institutional and national memory, as they serve as tangible evidence of the activities and decisions made by organizations over time. The significance of records lies not only in their content but also in the value attributed to them based on their use and function. In archival science, the classification of records into “primary value” and “secondary value” is a fundamental tool for determining the fate of a record—whether it should be preserved or destroyed—a process known as archival appraisal.

2.1. PRIMARY VALUE OF RECORDS

The primary value refers to the importance a record holds during its active use within the organization that created it. This value is derived from the administrative, legal, or financial functions the record serves in the course of daily operations. By nature, this value is temporary and expires once the immediate need for the record ceases (Millar, 2017).

The types of primary value based on usage include:

- **Administrative Value**: Records with administrative value are used to manage daily operations, such as internal correspondence, performance reports, and meeting minutes.
- **Legal Value**: These records serve to establish rights or obligations, including contracts, court rulings, and regulatory documents.
- **Financial Value**: These include records with direct financial implications, such as budgets, invoices, and receipts.

The retention period for records with primary value is determined by national legislation, internal institutional policies, or auditing and compliance requirements.

2.2. SECONDARY VALUE OF RECORDS

Secondary value emerges after the administrative or legal need for a record has ended. At this stage, the record is appraised based on whether it contains information of enduring significance for scientific research, historical documentation, or cultural and social understanding (Jimerson, 2009). This value forms the basis for decisions regarding permanent preservation in national or institutional archives.

The types of secondary value based on usage include:

- **Historical Value**: Records with historical value illustrate the evolution of policies, institutions, or events and are used as primary sources in historical writing.
- **Research Value**: These records are utilized in academic studies across disciplines such as sociology, economics, or political science.
- **Cultural or Social Value**: Such records reflect aspects of daily life, customs, and traditions, contributing to the understanding of national identity.

2.3. IMPORTANCE OF DISTINGUISHING BETWEEN THE TWO VALUES

Distinguishing between primary and secondary value is a core principle in archival science and has direct implications for records management. Accurate appraisal contributes to:

- **Making Retention or Disposal Decisions**: By determining whether a record merits its permanent preservation or can be discarded after its administrative utility ends.
- **Optimizing Resource Use**: Through reducing the volume of stored records, thereby saving space and costs.

- **Ensuring the Preservation of Long-Term Valuable Records**: Supporting the development of a rich and reliable national archive.

Shepherd and Yeo (2003) emphasize that archival appraisal is an analytical process requiring a deep understanding of the administrative and historical context of the record, as well as the anticipated needs of future users.

2.4. CLASSIFICATION OF DOCUMENTS BY ADMINISTRATIVE FUNCTIONAL STRUCTURE

Administrative documents are among the fundamental pillars upon which institutions rely to manage their daily operations, document their activities, and ensure the continuity of institutional work. The importance of documents lies in their role as a means of preserving information, serving as the organizational memory that safeguards rights, facilitates decision-making, and enables effective oversight.

The types of documents vary according to the administrative functions to which they belong, including planning, organizing, directing, and controlling. With the increasing volume of documents produced daily, the need arises to classify them based on scientific criteria, most notably archival value and production volume.

2.4.1. Planning Documents

- **Strategic Plans**: These are documents prepared at the senior management level, outlining the institution's long-term vision, overarching goals, and general means of achievement. They typically include an analysis of the internal and external environment (SWOT) and the identification of strategic priorities (Mintzberg, 1994). *Example: A five-year strategic plan that includes objectives such as geographic expansion or digital transformation.*
- **Operational Plans**: Developed at the level of executive departments, these plans translate strategic goals into specific programs and activities with defined timelines, budgets, and responsibilities (Kerzner, 2017). *Example: An annual operational plan for the Human Resources Department that includes training and recruitment programs*
- **Feasibility Studies:** These are analytical documents used to assess the viability of a project or investment decision from financial, technical, legal, and social perspectives. They serve as essential tools for informed decision-making (Kerzner, 2017).

2.4.2. Organizational Documents

- **Organizational Structure:** A document that outlines the formal framework of the institution, clarifying lines of authority, responsibility, and administrative hierarchy. It is used to define relationships among departments and units (Robbins & Coulter, 2018). Common types of structures include functional, divisional, and matrix structures.
- **Job Description:** A document that specifies the duties, responsibilities, and qualifications required for each position. It is used in recruitment, performance evaluation, and training. *Example: A job description for a "Financial Manager" detailing daily tasks, required qualifications, and necessary skills*

Policies and Procedures:

- **Policies**: General rules that guide employee behavior.
- **Procedures**: Detailed steps for carrying out specific tasks. *Example: An attendance and leave policy, and the procedure for submitting a leave request.*

2.4.3. Directive Documents

- **Internal Memoranda:** Brief documents used for formal internal communication within the organization, such as announcements, directives, or alerts. Example: A memorandum from the General Manager requesting employees to update their personal information.
- **Assignment Letters:** Official documents issued to employees assigning them specific tasks, often including the execution timeline and defined responsibilities. Example: Assigning an employee to prepare a report on sales performance for the first quarter.
- **Performance Reports**: Documents used to evaluate employee performance based on predefined criteria. They serve as tools for motivation and guidance toward improvement (Anthony & Govindarajan, 2007).

2.4.4. Control Documents

– **Monitoring and Evaluation Reports**: Used to compare actual performance against planned objectives, identify deviations, and propose corrective actions. Example: A monthly report tracking the progress of a specific project against its timeline.
– **Checklists:** Documents used to review task execution in accordance with established standards; they serve as tools for quality assurance. Example: A safety procedures checklist for the workplace environment.

– **Internal Audit Reports:** Documents prepared by the internal audit unit to assess operational efficiency, detect irregularities, and promote transparency (Anthony & Govindarajan, 2007).

2.5. THE IMPORTANCE OF CLASSIFYING DOCUMENTS ACCORDING TO ADMINISTRATIVE FUNCTIONS

The classification of documents based on administrative functions is essential for enhancing organizational efficiency by clarifying roles and responsibilities, supporting decision-making through the provision of accurate and well-documented information, strengthening oversight and accountability by tracking performance and deviations, and facilitating training and capacity-building through the use of clear reference documents.

2.5.1. Document Production Volume in Institutions and Value Classification

- **High-Volume Documents**: These are produced in large quantities on a daily basis, such as internal correspondence, forms, and periodic reports. They are often of temporary value and require efficient electronic classification and archiving systems to minimize paper accumulation.
- **Medium-Volume Documents**: Produced periodically, such as performance reports, meeting minutes, and work plans. Their value ranges from temporary to permanent depending on their content.
- **Low-Volume Documents**: Produced infrequently, such as contracts, agreements, and strategic decisions. These documents typically hold permanent or long-term value.

Table 1: Document Values and Production Rates by Institution.

Document Type	Archival Value	Production Volume	Example
Daily Correspondence	Temporary	High	Internal memoranda
Contracts and Agreements	Permanent (Legal)	Low	Partnership contract with an external party
Annual Performance Reports	Long-term (Administrative)	Medium	Employee performance report
Meeting Minutes	Permanent (Historical/Legal)	Medium	Board of Directors meeting minutes
Annual Budgets	Temporary (Financial)	Medium	Fiscal year budget

2.5.2. The Importance of Classification in Document Management

Classification is one of the fundamental pillars of document management systems due to its central role in organizing information and enhancing the efficiency of administrative processes. The key aspects of its importance include:

- **Enhancing Archival Efficiency:** Systematic classification helps identify documents of long-term value, enabling their organized archiving and facilitating future retrieval. It also reduces information clutter by sorting documents according to their type, function, and retention period.
- **Reducing Operational Costs:** By applying precise classification standards, institutions can dispose of documents that have lost their value or exceeded their legal retention period. This reduces physical or digital storage costs and improves resource utilization.
- **Supporting Decision-Making:** Classification enables quick and accurate access to relevant documents, thereby improving the quality of administrative and strategic decisions. Access to reliable and up-to-date information is a critical factor in dynamic work environments.
- **Ensuring Legal and Regulatory Compliance:** Classification helps ensure the retention of documents required by laws and regulations for specific periods, thereby reducing legal risks and enhancing institutional transparency and accountability.

Conclusion

Understanding the primary and secondary value of documents is fundamental to effective records and archives management. It ensures the preservation of significant documents and the systematic disposal of non-essential ones. It is recommended to raise awareness of these concepts among archival professionals and to develop effective evaluation tools based on international standards and best practices.

Classifying administrative documents according to administrative functions provides a systematic framework that enables institutions to organize their information and achieve integration across various activities. This approach contributes to enhancing transparency, improving decision quality, and ensuring institutional continuity. It represents a critical step toward building an effective and sustainable document management system.

Such classification not only facilitates information organization but also strengthens the institution's ability to adapt to governance requirements, digital transformation, and the preservation of institutional memory

3. THE THREE AGES THEORY OF DOCUMENTS AND ITS RELATIONSHIP TO SECURE DISPOSAL

Thompson & Brown (2022) describe the Three Ages Theory of Documents as a framework used to organize and manage documents throughout their lifecycle, from creation to final disposal. This theory divides the lifespan of documents into three primary stages: active documents, intermediate documents, and final disposition.

3.1. ACTIVE DOCUMENTS

Active documents are those in the phase of ongoing and frequent use. These documents are essential to daily organizational operations and require quick and frequent access. They are typically stored in workplaces or locations close to users to ensure ease of retrieval.

3.2. INTERMEDIATE DOCUMENTS

Intermediate documents refer to those no longer actively used but still required to be retained for a certain period for legal or administrative purposes. These documents are transferred to temporary storage facilities, where they can be accessed if needed but do not occupy space in offices.

3.3. FINAL DISPOSITION (PERMANENT ARCHIVE)

The final disposition includes documents no longer holding administrative or legal value but retaining historical or research significance. These documents are transferred to national archives or other archival institutions for permanent preservation. In some cases, documents without additional value are securely destroyed after the legal retention period expires.

The determination of a document's final disposition involves evaluating its ongoing value and the necessity of retaining or disposing of it. The process starts with assessing the current and future value of the document, considering administrative, legal, financial, and historical significance. For instance, legally critical documents may warrant long-term retention, while those with temporary value may be destroyed after a defined period.

Documents are categorized based on this evaluation into those for permanent retention or final secure disposal. Organizational or institutional archiving policies and guidelines are also considered. Based on this evaluation and categorization, a decision is made regarding the document's final disposition. This decision could involve either transferring the document to a permanent archive for sustained retention or implementing secure disposal measures if the document holds no further value.

3.4. THE THREE AGES THEORY OF DOCUMENTS AND ITS ROLE IN SECURE DISPOSAL WITHIN INFORMATION SECURITY STRATEGIES

The Three Ages Theory of Documents, which classifies documents into active, intermediate, and final disposition phases, is closely linked to the process of secure document disposal through the effective management of the document lifecycle. This involves determining the appropriate timing and method for disposal. Once the specified retention period ends—particularly in the non-active phases—secure disposal measures are implemented to ensure no sensitive information remains that could be misused (e.g., personal or financial data).

The method of disposal is chosen based on the document's sensitivity and lifecycle stage. For example, financial documents (such as bank statements) are destroyed using mechanical shredding after seven years, while highly confidential documents (such as military records) are disposed of following higher security standards after their lifecycle ends. This reduces risks such as privacy violations or information leaks caused by unnecessary retention.

CONCLUSION

The Three Ages Theory provides a framework for managing the document lifecycle, while secure disposal serves as the practical procedure that ensures documents are disposed of at the right time and in ways that minimize security and legal risks.

4. LEVELS OF SECURE DOCUMENT DESTRUCTION AND SHREDDING

Document destruction is a critical component of information security, ensuring that confidential data remains irretrievable after disposal. With the increasing prevalence of cyber threats and regulatory demands—such as the General Data

Protection Regulation (GDPR) and the Health Insurance Portability and Accountability Act (HIPAA)—it is imperative for governmental and private institutions to adopt systematic destruction protocols to mitigate the risks of data breaches (Jones & Smith, 2020). The German standard DIN 66399 classifies document destruction into seven security levels (P1–P7), each defining permissible particle sizes and destruction methods based on data sensitivity (DIN, 2012). Below is an outline of these levels, their technical specifications, and applications to guide compliance and risk management:

4.1. BASIC PROTECTION (P1)

The P1 level, offering the lowest security, shreds documents into strips with an area ≤ 2,000 mm². It is suitable for non-confidential materials, such as general office papers, providing minimal security, as the strips can be reassembled relatively easily (NIST, 2020).

4.2. LOW-SECURITY DISPOSAL (P2)

The P2 level requires shredding documents into strips with an area ≤ 800 mm². This method is typically used for internal documents with low sensitivity, such as drafts or memos (DIN, 2012).

4.3. MEDIUM SECURITY (P3)

P3 introduces crosscut shredding, reducing documents to particles ≤ 320 mm² (e.g., 4 × 80 mm²). This level is recommended for confidential data such as customer invoices (NSA/CSS Policy Manual 9–12, 2020).

4.4. ENHANCED CONFIDENTIALITY (P4)

P4 particles measure ≤ 160 mm² (e.g., 2 × 80 mm²) and are suitable for sensitive personal data. Financial institutions often adopt this level for client records (ISO/IEC 21964, 2018).

4.5. HIGH-SECURITY DESTRUCTION (P5)

At the P5 level, particles are reduced to ≤ 30 mm² (e.g., 1.2 × 15 mm²), rendering reconstruction nearly impossible. This level is used for classified government documents (DIN, 2012).

4.6. DISPOSAL OF HIGHLY CONFIDENTIAL DOCUMENTS (P6)

The P6 level requires particles ≤ 10 mm² (e.g., 1 × 5 mm²), aligning with military and state intelligence protocols. It is used for the destruction of national secrets (NSA/CSS, 2020).

4.7. MAXIMUM SECURITY (P7)

The highest security level, P7, reduces documents to particles ≤ 5 mm² through pulverization. This method is reserved for highly classified data, such as encryption keys (NIST, 2020).

Table 2: Destruction Standards and Application.

Standard	Shredding Size	Destruction Samples	Security Level	Usage
P1	≤ 2000 mm²	Strip	Low	Non-confidential documents that do not require a high level of security (e.g., brochures).
P2	≤ 800 mm²	Strip	Low to Medium	Internal non-confidential information (e.g., organizational policies).
P3	≤ 320 mm²	Small Cuttings	Medium	Data that may cause limited harm if leaked (e.g., performance evaluations).
P4	≤ 160 mm²	Small Cuttings	Medium to High	Confidential information that may affect reputation or operations (e.g., contracts).
P5	≤ 30 mm²	Fine Cuttings	High	Sensitive and critical documents, high-risk financial or technical data (e.g., product designs).
P6	≤ 10 mm²	Ultra-Fine Cuttings	Very High	Highly confidential data, such as critical strategic information (e.g., military secrets, international expansion plans).
P7	≤ 5 mm²	Micro Particles	Ultra-High	Extremely confidential data that could endanger national or human security (e.g., encryption keys).

The selection of the destruction level is determined by the sensitivity of the data, regulatory requirements, and threat models. While P1–P2 levels are sufficient for routine disposal, P3–P5 levels are critical for personal and financial data (Jones & Smith, 2020). On the other hand, P6–P7 levels align with stringent standards, such as the "Top Secret" classification by the U.S. National Security Agency. Organizations must balance security requirements with operational costs, as higher levels of security necessitate specialized equipment (ISO/IEC 21964, 2018).

CONCLUSION

Adhering to destruction levels ensures compliance and minimizes the risks of data breaches. Organizations should conduct risk assessments to select appropriate pro-

tocols, prioritizing P5–P7 levels for highly sensitive data. Future research should focus on developing cost-effective technologies to achieve higher security levels.

5. THE IMPACT OF SECURE DISPOSAL ON INFORMATION CONFIDENTIALITY

Given the increasing security threats and risks to confidential information, secure document disposal has become essential to prevent the unauthorized access or leakage of sensitive data. Secure disposal contributes to maintaining information confidentiality and protecting it from breaches.

5.1. ANALYSIS OF THE IMPACT OF SECURE DISPOSAL ON PROTECTING CONFIDENTIAL INFORMATION

Secure document disposal is vital for ensuring information confidentiality and safeguarding organizations from potential risks. Insecure disposal of documents can result in leaks of personal or financial data, leading to fraud or significant legal losses. For instance, the 2017 Equifax data breach, affecting 147 million users, stemmed from negligence in securely disposing of electronic records (Goodman, 2018). This incident underscores the critical role of secure disposal as a preventive measure, with its impact evident in the following areas:

5.1.1. Reducing the Likelihood of Data Leaks: Many organizations rely on secure disposal to ensure that confidential information does not leak. According to a study by Smith (2020), applying secure disposal techniques reduces the likelihood of data leaks by 95%.

5.1.2. Protecting Identity and Personal Data: Secure disposal of documents is the primary means of safeguarding personal identity and data from theft. A study by Brown (2019) showed that secure disposal prevents unauthorized access to personal data and reduces identity theft incidents by 80%.

5.1.3. Minimizing Risks and Ensuring Legal Compliance: Secure disposal policies mitigate the legal risks associated with sensitive data leaks. According to Kim (2021), secure disposal helps organizations comply with data protection laws and regulations, reducing exposure to fines and penalties.

5.1.4. Building Trust Between Clients and Organizations: Secure disposal enhances trust between clients and organizations, as clients feel secure knowing their sensitive information is handled safely and effectively. A study by Lee

(2018) revealed that 75% of clients prefer dealing with organizations that implement secure disposal policies.

5.2. COST-BENEFIT ANALYSIS OF SECURE DOCUMENT DISPOSAL

In analyzing the cost-benefit aspect of secure document disposal, balancing the expenses of implementing advanced disposal technologies and the tangible security benefits is critical for maximizing organizational value. Direct costs include technology expenses (such as shredders certified under NIST SP 800-88 standards), employee training, and adopting auditing protocols that comply with ISO/IEC 27001 standards (Smith & Johnson, 2020).

On the other hand, the benefits involve avoiding financial losses resulting from data breaches, which are estimated at an average of $4.24 million per incident according to the Ponemon Institute (2021). Additionally, organizations can avoid legal penalties, such as those regulated under Article 32 of the GDPR in the European Union. A case study in the healthcare sector (Jones et al., 2019) revealed that investing in encrypted disposal systems reduced breach costs by 37% over five years, despite a 15% increase in initial expenses.

However, some organizations overlook indirect cost analysis, such as the loss of reputation and organizational standing, which are difficult to quantify but represent 35% of total losses, as reported by IBM Security (2022). It is therefore recommended to adopt dynamic analytical models that consider data sensitivity and its lifecycle (NIST, 2020), prioritizing investments in secure disposal for highly sensitive data, such as financial or health records, to maximize security returns (ISO/IEC 27001:2022).

CONCLUSION

Secure document disposal plays a vital role in protecting confidential information from leaks and breaches, reducing legal risks, and building trust between clients and organizations. Disposal techniques vary based on document and data types, but the common objective is to ensure that information cannot be retrieved in any form.

6. LEGISLATIONS AND REGULATIONS RELATED TO INFORMATION SECURITY AND SECURE DISPOSAL

In the current digital era, protecting confidential information from leakage and breaches is of utmost importance. This protection requires strict legislation and

regulations that govern how sensitive documents are handled and securely destroyed. Here, we will review some international and local laws and policies governing this field.

6.1. INTERNATIONAL LAWS AND STANDARDS

6.1.1. General Data Protection Regulation (GDPR): Adopted by the European Union, this is one of the most stringent laws in the field of data protection. It obliges organizations dealing with individual data within the EU to comply with strict data protection standards, including secure document destruction.

6.1.2. ISO 27001 Standards: These are among the most important international standards that define the requirements for an Information Security Management System (ISMS). These standards include procedures for secure document disposal as part of information security management.

6.1.3. ISO/IEC 21964 Standard: this international standard defines principles and terms for the destruction of data carriers. It aims to ensure the secure and effective destruction of data, including definitions and principles for data destruction across various media.

6.2. GAP ANALYSIS ON THE ALIGNMENT OF INTERNATIONAL STANDARDS WITH LOCAL LAWS

6.2.1. Coverage and Inclusiveness: International standards provide comprehensive guidelines for data destruction across various media, while local laws in Arab countries focus more on personal data protection without precise specifications for disposal methods (Clyde & Co, 2025).

6.2.2. Implementation and Compliance: International standards require precise implementation and defined procedures for data disposal, whereas local laws face practical challenges in implementation and compliance due to the lack of clear executive regulations and guidelines (InCountry, 2023).

6.2.3. Updates and Development: International standards are regularly updated to keep pace with technological advancements, while local laws in Arab countries may lag in updates and development, leading to security gaps (Corporate Compliance Insights, 2024).

Conclusion

This analysis reveals clear gaps between international standards and local laws in Arab countries regarding secure data disposal. Bridging these gaps requires enhancing collaboration among stakeholders and updating local laws to align with international standards.

7. CHALLENGES FACING SECURE DOCUMENT DESTRUCTION

In the modern era, secure document destruction is a top priority for organizations dealing with sensitive information. The goal of secure document destruction is to protect confidential data from unauthorized access and leakage, making it a vital aspect of information security. With increasing reliance on digital technologies and the accumulation of electronic documents, organizations face numerous challenges that may hinder secure destruction processes. These challenges include outdated technologies, lack of employee training, high destruction costs, and compliance with legal standards. Therefore, a comprehensive understanding of these challenges and the pursuit of effective solutions are necessary to maintain information security.

7.1. OUTDATED TECHNOLOGIES:

Many organizations rely on outdated or obsolete technologies in destruction processes. These technologies may not guarantee complete and secure destruction of documents, thereby exposing information to risks (Smith, 2020).

7.2. LACK OF TRAINING:

A significant challenge is the lack of training among employees. Without adequate understanding of the importance of secure destruction and how to perform it correctly, errors may occur that lead to data leaks (Johnson & Brown, 2019).

7.3. COST OF DESTRUCTION:

The financial burden of secure document destruction poses challenges for institutions, as it requires investment in equipment, software, and employee training (Smith, 2020).

7.4. COMPLIANCE WITH LEGAL STANDARDS:

Organizations face challenges in complying with the legal and regulatory standards governing secure document destruction. Laws vary from country to country, and institutions must ensure adherence to these laws to avoid penalties (Lee, 2018).

7.5. MANAGING ELECTRONIC DOCUMENTS:

With the increasing use of electronic documents, the secure destruction of these documents becomes a new challenge. Organizations must ensure that digital documents are destroyed in a way that prevents recovery (Davis & Martin, 2021).

Conclusion

Secure document destruction is a critical process that organizations must adhere to, in order to protect sensitive information. Outdated technologies, lack of training, high costs, legal challenges, and the management of electronic documents are among the key challenges faced by institutions in this area. Overcoming these challenges requires investment in modern technologies, periodic employee training, and ensuring compliance with legal and regulatory standards. By adopting these strategies, organizations can enhance their information security and safeguard it against potential risks.

8. CASE STUDY: THE SECURE DOCUMENT DESTRUCTION FACILITY IN THE SULTANATE OF OMAN

Aligned with the modern concept of document management systems and the Sultanate of Oman's adoption of an advanced documentary framework that considers various administrative, environmental, and security aspects regarding the protection of classified information and documents in terms of their origin, circulation, storage, and disposal, as well as adherence to international agreements on environmental and climate safety and reducing harmful emissions caused by improper practices, the idea of establishing the Secure Document Destruction Facility under the National Records and Archives Authority was conceived. This initiative embodies a forward-looking vision planned long ago to ensure secure document destruction for all state institutions.

The Secure Document Destruction Facility is a government project that provides comprehensive solutions and services for securely destroying paper documents,

electronic media, and similar materials for all government entities, private companies, and individuals in accordance with applicable legal and administrative procedures. This is achieved using the latest technologies in secure destruction processes while adhering to all standards of precision and confidentiality. This aligns with the government's directions in enhancing information security and preserving the Omani environment. The facility is the first of its kind in the Middle East as an integrated central governmental facility, certified with ISO standards for Quality (ISO 9001:2015) and Health and Safety (OHSAS 18001:2007).

8.1. OBJECTIVES OF THE SECURE DOCUMENT DESTRUCTION FACILITY

- Ensuring centralized execution of public document destruction processes for all entities seeking this service.
- Guaranteeing complete accuracy and confidentiality in destruction processes, ensuring no public documents are leaked, thus safeguarding the interests of the state, individuals, and groups.
- Ensuring legal methods for public document destruction, avoiding reliance on burning, burying, or disposal in general waste dumps.
- Preventing access to and misuse of public documents by private companies.
- Reducing the financial cost of secure public document destruction for governmental, private institutions, and individuals.
- Providing confidentiality and privacy during the destruction process for all entities involved.
- Supporting the government's direction in enhancing information security and preserving the Omani environment.
- Organizing and documenting all destruction operations, conducting annual follow-ups, and preparing resulting statistics and studies.
- Encouraging small and medium-sized enterprises to engage in projects for recycling destroyed paper and electronic waste.

8.2. LEGAL FOUNDATIONS OF DOCUMENT DESTRUCTION IN OMAN

Pursuant to the Records and Archives Law issued by Royal Decree No. 60/2007 and its Executive Regulations, entities are responsible for their documents until they are no longer needed. Departments of records routinely sort intermediate

documents upon the expiration of retention periods to identify those requiring permanent preservation by the Authority and those designated for destruction. The law and its regulations outline principles for sorting and destruction.

The law specifies that the entity creating the documents is responsible for their destruction and mandates, as stated in Article 24, that: "Documents prepared for destruction after sorting must be destroyed following specified procedures, and any entity wishing to perform destruction must obtain approval from the Authority." The Executive Regulations further clarify in Article 24 that: "Following approval from the Authority, entities shall shred paper documents mechanically and recycle them whenever possible. For other documents, data contained therein must be destroyed, and media reused whenever possible."

These foundations also consider Article 18: "Entities are responsible for sorting intermediate documents after the retention periods, transferring archives to the Authority, and destroying other documents according to regulations outlined in Article 21."

Mechanisms and guidelines have thus been established for entities intending to destroy documents, adhering to internationally accepted legal procedures. This eliminates incorrect practices that previously compromised document security, infrastructure, environmental, climatic, and health aspects.

8.3. SERVICES OF THE SECURE DOCUMENT DESTRUCTION FACILITY IN OMAN

8.3.1. Beneficiaries of the Facility's Services

- All governmental entities and institutions.
- All private companies and organizations.
- Individuals and private citizens.

8.3.2. Types of Destruction Services at the Secure Document Destruction Facility

- **Paper Document and File Destruction Service:**

The facility is equipped with two paper shredders.

Each machine can destroy paper documents, files, and books.

Features include the ability to separate paper from metal during destruction.

Document shredding size is P4 standard.

Each machine can destroy between one ton and 1.5 tons per hour.
Includes the capability to extract paper dust.

- **Highly Confidential Document Shredder:**

Designed for the destruction of documents classified as “highly confidential.»
Destruction size is P7 standard.
The machine can turn paper documents into outputs resembling powder.

- **Hard Disk Destruction Service:**

Equipped with a highly secure machine.
The machine’s software is heavy-duty.
Capable of destroying 15 hard disks simultaneously.
Also has the ability to destroy mobile devices and flash drives, which are placed in designated containers.

- **Magnetic and Optical Media, Audio, and Video Tape Destruction Service:**

Capable of destroying all audio tapes, magnetic and optical discs, video tapes, identity cards, and similar items.

- **Destruction of Telecommunication Equipment:**

Features a machine capable of destroying all communication devices, including computers, laptops, and wireless communication devices.
The machine is equipped with very strong and large cutters capable of destroying devices of considerable sizes.

- **Compactor for Destroyed Documents:**

Each compact bundle ranges from 350 to 500 kg.
The compactor can accommodate four lines for paper destruction.

8.4. PROCEDURES FOLLOWED FOR DOCUMENT DESTRUCTION AT THE SECURE DOCUMENT DESTRUCTION FACILITY

The process of secure document destruction involves preparatory and organizational measures related to both administrative and technical procedures.

- **Administrative Procedures:**

Respecting the rules of document retention schedules, the division responsible for document management in the concerned entity prepares the files and documents intended for destruction by sorting them and separating them from those designated for transfer to the National Records and Archives Authority for permanent

preservation for scientific and historical research purposes. The files intended for destruction are placed in folders or any available storage units after verification by specialists in the department or division, followed by inspection by individuals responsible for sorting and destruction procedures at the National Records and Archives Authority to ensure compliance with retention periods specified in the schedules. This process is known as pre-monitoring of the physical and actual transfer of files to the Secure Document Destruction Facility. If the files comply and respect the timelines outlined in the schedules, the remaining steps are as follows:

- Fill out the form prepared by the Authority for this purpose, and have it signed by the administrative division head where the documents originated, signifying approval. The head of the department or division responsible for the documents also signs the form.
- Send this form to the Authority for approval of the destruction, with the Authority retaining a copy of the form.
- After the Authority's approval, the concerned entity destroys paper documents through mechanical shredding and endeavors to recycle them whenever possible. For other media, the contained data is destroyed and the media reused whenever feasible.
- The concerned entity drafts a report for each destruction operation, which is kept by the document department or division along with the destruction form for the destroyed documents approved by the Authority. A copy of this report is sent to the Authority.
- **Technical Procedures:**

The destruction process is conducted after obtaining approval from the National Records and Archives Authority, following these steps:

- The concerned entity contacts the National Records and Archives Authority to request approval for the destruction operation.
- The Authority determines a date for the entity to execute the document destruction operation.
- The concerned entity transports the documents designated for destruction to the Secure Document Destruction Facility affiliated with the Authority (the Authority may provide special and secure containers for document transportation).

- Weigh the documents to be destroyed and issue a receipt showing their weight.
- Place the documents prepared for destruction in secure containers meeting all security and confidentiality requirements.
- Execute the document destruction process in the presence of a representative from the concerned entity.
- Issue a certified certificate of completion for paper or electronic document destruction to the concerned entity (upon request).
- Issue an invoice outlining the type of service provided during the destruction operation and specify the price according to applicable procedures and the destruction service fee schedule.
- The Authority manages the outputs of the destruction process, whether paper or electronic, according to the relevant organizational procedures.
- The entity responsible for the destroyed documents prepares a destruction report and records the operation in the destruction activities register.

8.5. CHALLENGES FACING DESTRUCTION OPERATIONS AT THE SECURE DOCUMENT DESTRUCTION FACILITY:

Operating the Secure Document Destruction Facility is crucial for maintaining the confidentiality and security of sensitive information. In the era of technology and information, protecting data and preventing unauthorized access is indispensable. This requires precise procedures and advanced techniques to ensure safe and effective document destruction in compliance with applicable laws and regulations. However, several challenges are encountered in operating this facility, including:

- **Technology and Techniques:** Even with the destruction of paper documents, digital data remains vulnerable to breaches if not destroyed correctly. This highlights the need for updated technologies capable of irreversible document destruction. Smith (2020) emphasizes that using the latest technologies to ensure secure and effective document destruction requires significant investments in equipment and software. The Authority addressed this challenge by employing advanced techniques such as fine shredding or thermal destruction.
- **Operational Challenges:** These include high operating costs, difficulty in handling large volumes of documents in a short period, especially in large or governmental institutions, risks of losing documents during transport to destruction facilities, and lack of secure storage spaces in cases of delays and

document accumulation. Johnson (2018) stresses the importance of cooperation among governmental and private entities to ensure coordinated and efficient destruction operations. The Authority resolved this challenge by organizing destruction operations according to a scheduled timetable for each entity and procuring an armored vehicle for secure document transportation. Additionally, many institutions are transitioning to digital systems, reducing reliance on paper and the need for traditional destruction facilities.

- **Legislation and Procedures:** Accumulation of documents in entities that have not adopted a classification system and retention schedules that define document lifespans and types requiring destruction remains a challenge. Jones & Brown (2019) highlight that unclear or non-existent regulations in institutions lead to random destruction, exposing entities to legal and administrative accountability. The Authority addressed this challenge by adhering to the legal and administrative procedures specified in the National Records and Archives Law to ensure lawful and secure document destruction.
- **Environmental Protection:** Some entities fail to separate materials such as paper, plastic, metals, and device batteries when destroying documents, complicating the destruction process and disposal of waste in environmentally unfriendly ways that may cause environmental issues or legal violations. Green (2021) underscores the need to avoid unsafe traditional methods like burning or burying and to pursue environmentally friendly solutions like paper recycling. The Authority tackled this challenge by collaborating with environmentally certified recycling companies and legally banning burning and burying practices.
- **Awareness and Training:** Lack of awareness of the importance of secure destruction, particularly in small companies, results in traditional disposal methods with difficulties ensuring external destruction companies comply with required standards. The Authority overcame this challenge by raising employee awareness about the importance of secure destruction, training them on proper procedures to ensure accurate operations, and conducting periodic audits to ensure legal and security compliance.

Operating the Secure Document Destruction Facility faces several challenges, including adopting cutting-edge technologies, adhering to legal procedures, enhancing collaboration among various entities, and protecting the environment.

Moreover, awareness and training play a vital role in ensuring proper and effective destruction operations. By addressing these challenges and developing innovative solutions, a high level of security and confidentiality can be achieved in document destruction processes.

8.6. PERFORMANCE RESULTS AND STATISTICS OF THE SECURE DOCUMENT DISPOSAL FACILITY IN THE SULTANATE OF OMAN

The establishment of the Secure Document Disposal Facility in the Sultanate of Oman marked a transformative milestone in end-stage document management. This achievement was not merely technical in nature; rather, it embodied both administrative and behavioral dimensions, reflected in the positive reception and engagement of relevant entities with the facility's operational mechanisms. Performance indicators reveal that such acceptance was neither superficial nor coerced. Instead, it stemmed from growing confidence in the facility's efficiency and the quality of its procedures, the clarity and formal documentation of its processes, and the underlying transparency and credibility this fostered. Furthermore, a supportive regulatory and legislative framework has enabled both public and private institutions to embrace secure document disposal as a core aspect of institutional governance.

Statistical reports from the National Records and Archives Authority indicate a steady increase in disposal requests in recent years. This trend points to an evolving organizational culture characterized by the voluntary and proactive adoption of professional standards in document management. These metrics offer concrete evidence that the facility has succeeded in forging a collaborative relationship with institutions, anchored in trust and specialization, thereby reinforcing its strategic security and administrative objectives.

The analysis of the facility's performance yields a set of scientific and administrative indicators that affirm its effectiveness in enhancing institutional security and regulating disposal operations, as further illustrated in Figure 1 and Figure 2 below.

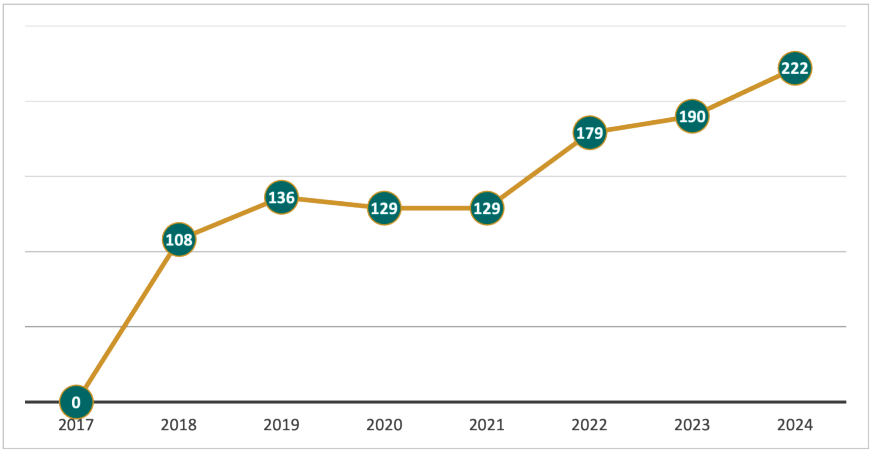


Figure 1: Approvals vs. Requests by Entities

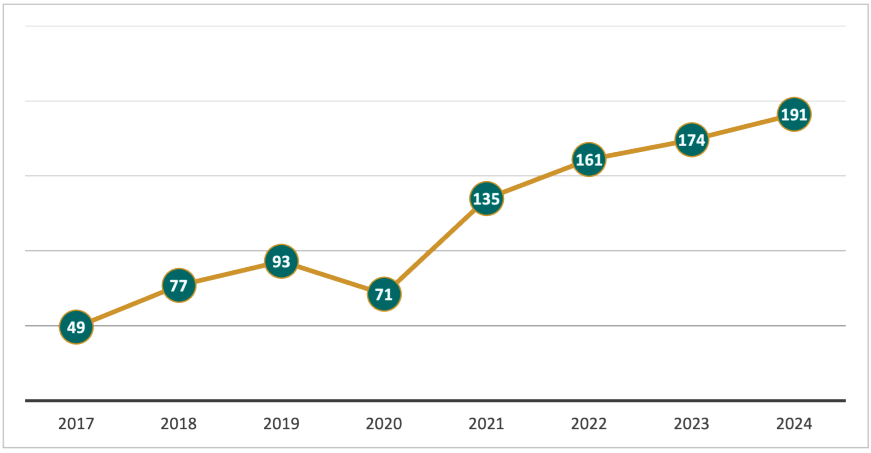


Figure 2: Rising Disposal Operations with Increasing Demand

It is noteworthy from the above that the growing number of disposal requests reflects the expanded utilization of the facility as a trusted service provider. This growth serves as a scientific indicator of the successful realization and enhancement of institutional security across the Sultanate of Oman through the mechanism of secure document disposal.

CONCLUSION

The Sultanate of Oman has successfully pioneered the establishment and operation of the Secure Document Destruction Facility, a model to emulate in the region. This initiative aimed to protect sensitive and confidential information securely and efficiently by adopting the latest technologies and appropriate legal procedures.

The Omani experience encountered multiple challenges, including technological, environmental, and organizational hurdles. It was imperative to adopt state-of-the-art technologies to ensure secure and effective document destruction and to comply with the legal procedures outlined in the National Records and Archives Law. Cooperation among governmental and private entities was essential for coordinated and effective destruction operations.

The success of this initiative was achieved through increasing employee awareness and training on the importance of secure destruction and proper execution procedures. Environmentally friendly solutions were also pursued for document destruction, such as paper recycling instead of burning or burying.

Thanks to these efforts, Oman has achieved a high level of security and confidentiality in document destruction, making it a model for the region and the world.

9. CONCLUSIONS

Implementing secure destruction procedures reduces the risk of unauthorized access to sensitive documents, contributing to the protection of confidential information in organizations.

When institutions adopt secure document destruction practices, they enhance trust among clients and partners by presenting a professional and reliable image regarding information security.

Secure destruction operations assist in complying with laws and regulations related to data protection, such as the Personal Data Protection Act. Adherence to these laws protects institutions from fines and legal penalties.

Secure destruction reduces the chances of leaking sensitive information to competitors or external entities, helping to maintain the organization's competitive advantage.

The secure destruction process requires proper organization and planning, leading to improved internal procedures and reducing the chaos caused by accumulating unnecessary documents.

Implementing secure destruction programs contributes to increasing employee awareness of the importance of information protection and following proper procedures for document destruction.

Using modern technologies in destruction processes significantly contributes to achieving high levels of security and efficiency in the disposal of sensitive documents. Adopting digital destruction systems and advanced shredding devices enhances process efficiency and reduces the risk of information recovery.

Searching for environmentally friendly solutions for document destruction helps mitigate the environmental impact of traditional methods such as burning and burying. Recycling paper and converting it into new materials can serve as a sustainable and effective alternative.

The experience of the Sultanate of Oman in establishing and operating the Secure Document Destruction Facility reflects a clear commitment to protecting both information security and the environment. By enhancing collaboration, adopting advanced technology, and adhering to the legal framework, secure and effective destruction operations can be achieved, contributing to the protection of sensitive and confidential data.

10. RECOMMENDATIONS

Based on the aforementioned conclusions, several recommendations can be presented to enhance information security in organizations through secure document destruction:

- **Adopting Modern Technologies:** Utilize advanced destruction systems, such as digital shredding technologies and sophisticated equipment, to ensure the secure and effective disposal of sensitive documents.
- **Developing Clear Policies and Procedures:** Organizations should establish clear policies and procedures for secure document destruction while adhering to relevant laws and regulations. Regular reviews and updates of these policies are recommended to ensure their effectiveness.
- **Conducting Awareness Campaigns and Training Programs:** Institutions should organize awareness campaigns and training programs to educate employees on the importance of secure destruction and the correct procedures for implementation. These programs may include workshops and regular training sessions.
- **Enhancing Cooperation:** Strengthen collaboration between governmental and private entities to coordinate secure destruction processes. Establishing joint committees or interactive platforms for exchanging knowledge and expertise among parties is advisable.

- **Exploring Environmentally Friendly Solutions:** Look for sustainable alternatives for document destruction, such as recycling paper and using biodegradable materials. Organizations can work on developing practices that minimize environmental impact.
- **Performing Regular Evaluations:** Conduct periodic assessments of destruction operations to ensure the achievement of defined objectives and identify areas for improvement. Results from these evaluations can be used to develop new strategies and enhance performance.

By implementing these recommendations, organizations can better enhance information security and protect sensitive data. Adopting modern technologies, adhering to legal procedures, fostering cooperation and awareness, can contribute to achieving a high level of security and confidentiality in document destruction processes. These continuous efforts help protect information and strengthen trust between organizations, their clients, and partners.

11. CONCLUSION

The key findings of this research demonstrate that enhancing information security through secure document destruction is a vital tool for safeguarding confidential data in governmental and private institutions. Secure destruction encompasses multiple levels and techniques, ranging from basic destruction to high-security destruction, relying heavily on modern technologies and stringent legal procedures. The "Three Ages Theory" highlights the importance of destruction as the final stage in the information lifecycle, ensuring safe disposal after its usage.

The secure destruction process faces technical, organizational, and environmental challenges, yet these can be overcome through collaboration and coordination among various entities, alongside employee awareness. The Sultanate of Oman's experience in establishing and operating the Secure Document Destruction Facility serves as a testament to how nations can successfully implement these concepts, enhance information protection while reducing risks of leakage and unauthorized access.

Thus, investing in secure destruction is a strategic step necessary to enhance information security and maintain trust between institutions, their clients, and partners.

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Boštjan Dornik[1]

SYSTEMATIZATION OF THE AUDIOVISUAL ARCHIVAL PROFESSION IN TELEVISION IN THE DIGITAL ERA

Abstract

Purpose: *The digital transformation of the television industry has significantly altered the professional landscape of audiovisual archiving. Traditional job classifications no longer reflect the competencies required for managing digital content, prompting the need to revise existing frameworks. This study aims to analyse the evolving professional roles and emerging competencies within audiovisual archiving, with a focus on the impact of digital transformation on job classification structures at Radiotelevizija Slovenija (RTV Slovenia). The objective is to develop a revised classification model that reflects the current demands of digital archival practice.*

Method/approach: *A qualitative, descriptive, and analytical approach was used, combining normative analysis of legal and institutional documents (e.g., the Employment Relationship Act and Job Classification Act) with a critical review of scientific and professional literature. Existing job roles were assessed in relation to technological changes and international best practices.*

Results: *The findings revealed significant discrepancies between existing archival roles and the requirements of digital workflows, such as metadata management, digital preservation, and the application of artificial intelligence tools. Based on this analysis, a new classification model was proposed, comprising seven professional and three technical levels, differentiated by educational attainment and task complexity.*

Conclusions/findings: *The proposed model addresses the need for a modernized job structure that supports the integration of digital technologies and interdisciplinary collaboration. It ensures alignment with both institutional needs and international standards for archival competence. The framework promotes sustainable human resource development and enhances the strategic role of audiovisual archivists in the digital era.*

Keywords: *audiovisual archiving; digital transformation; archival profession; job classification; archival workforce development*

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1 INTRODUCTION

The purpose of this study is to examine the emerging tasks and evolving professional roles within the field of audiovisual archiving in the context of digital society. The impetus for this research stems from the need to revise the job classification system within the archival services of Radiotelevizija Slovenija (further referred to as RTV Slovenia), prompted by the drafting of a new Job Classification Act (2009) (Akt o sistemizaciji delovnih mest). In accordance with Article 22 of the Employment relationship act (2013) (further ZDR-1), organizations are required to "meet the prescribed conditions as defined by collective agreements, general employer acts, or as required by the employer" to ensure appropriate job performance.

The classification system represents an organizational and human resources act that serves as a structural basis for aligning programmatic and business processes, institutional organization, and human resources (Job Classification Act, 2009, Article 2). One of its fundamental objectives is the organization and distribution of work and definition of operational procedures (Job Classification Act, 2009, Article 3). With the introduction of digital television, the current act adopted in 2009 has become obsolete. Although job descriptions were updated in 2013, the revision failed to incorporate the technological shift in the archival profession, and the current roles no longer reflect contemporary professional requirements.

2 METHODOLOGY

This study is based on a qualitative, descriptive, and analytical approach, aimed at examining the adequacy of the current job classification system at RTV Slovenia in the context of the digital transformation of archival work. The analysis focuses on the categorization of archival positions according to educational requirements, task complexity, and the incorporation of emerging technological competencies. The methodological framework includes a normative analysis of legal and institutional documents, particularly the ZDR-1 (2013) and the Job Classification Act (2009), to ensure the proposed classification model is aligned with applicable regulatory standards. In addition, the study draws on international scientific and professional literature to contextualize the evolving nature of archival professions.

A comparative analysis is conducted between existing and proposed job profiles, with particular attention to the gaps created by digital technologies such as digitization, metadata management, and artificial intelligence–supported workflows.

3 REDEFINING THE ARCHIVAL PROFESSION IN RESPONSE TO TECHNOLOGICAL CHANGE

Traditionally, the role of the archivist was primarily defined by the core functions of archival management, with a central mission focused on the preservation and facilitation of access to archival materials. In the contemporary context, however, the archival profession is undergoing significant transformation, shaped by both the growing recognition of its societal relevance and ongoing technological advancements (Şentürk, 2021, 87). The management of electronic records poses significant challenges, both in terms of the volume and complexity of the materials involved, as well as the advanced technical skill set required to ensure their proper handling, preservation, and accessibility (DCMS et al., 2009, 8).

Archivist is in the dictionary of The Society of American Archivists defined as an individual responsible for appraising, acquiring, arranging, describing, preserving, and providing access to records of enduring value, according to the principles of provenance, original order, and collective control to protect the materials' authenticity and context, and as an individual with responsibility for management and oversight of an archival repository or of records of enduring value (Pearce-Moses, 2005, 33).

According to Screenskills (2025)[2] film archivists serve a crucial function within the film and television industry, operating in a role that closely parallels that of librarianship, but specifically oriented towards audiovisual media. They are typically employed by major film studios, broadcasting organizations, national film institutions, or dedicated film archives. Their work encompasses the management, preservation, and accessibility of both historical and contemporary audiovisual materials. A central task of the film archivist involves the systematic catalogue of content. This includes the insertion of detailed metadata into digital

2 ScreenSkills is the industry-led skills body in Great Britain for the screen industries. It offers sector insight, training and career advice for existing and emerging talent. ScreenSkills also conducts consultation work with industry, publish research and strategic documents, runs funding schemes and project work, and provides information about the challenges that face the industry.

files to facilitate efficient retrieval and long-term discoverability. In addition to descriptive work, archivists are also engaged in the physical and digital preservation of media. This includes the restoration and digitization of film reels, magnetoscopic tapes, and other legacy formats, often with the objective of migrating content to stable, future-proof digital platforms to ensure sustained access and archival integrity. Moreover, film archivists frequently interact with a wide range of stakeholders including producers, researchers, and editors responding to requests for footage in a timely and organized manner. Their ability to locate and provide specific materials swiftly is a valued skill in production and research contexts. Notably, the archival profession within the film sector is one of the few roles that generally adheres to standard working hours, distinguishing it from the often-unpredictable schedules of other film industry professions.

Within the field of audiovisual archiving, professional roles can be categorized into several hierarchical levels, each associated with distinct responsibilities and expertise.

At the entry level, roles such as processing technicians, project archivists, assistant archivists, and shippers are primarily concerned with the preliminary handling and preparation of archival collections. Their responsibilities typically include tasks such as surveying materials, organizing content, performing basic conservation, rehousing items, cataloguing, preparing media for playback, digitizing materials for access, and managing the physical movement and storage of archival items.

Mid-level positions include archivists, cataloguers, reference specialists, vault managers, librarians, project coordinators or managers, consultants, and curators. Professionals at this level usually possess greater experience in project management and tend to specialize in specific areas of archival practice. These may involve public engagement through research support, coordinating preservation workflows, managing acquisitions, or developing curatorial and programming initiatives.

Specialist and engineering roles, which may fall within the mid- to upper-level range, are characterized by advanced technical proficiency. These professionals often focus on specialized domains such as photochemical film processing, color timing, digital image restoration, sound and video preservation, database architecture, and digital asset management. Their expertise is essential in maintaining the technical integrity and longevity of audiovisual materials.

At the upper level of the profession, leadership roles are typically held by directors, senior managers, or department heads within large archival institutions or private preservation and restoration firms. These individuals are responsible for strategic oversight, organizational leadership, and the development of long-term preservation policies and practices (Arton, 2015, 2). All occupational levels are progressively integrated with technological applications.

The practice of archival work is becoming increasingly reliant on technological systems and while archivists continue to play a key role in core archival functions, their responsibilities are increasingly embedded within multidisciplinary teams. These teams may engage not only in records management but also in areas such as cybersecurity, blockchain-based distributed ledger systems, digital forensics, electronic discovery, and information governance. Moreover, archivists are required to perform their duties within the broader context of evolving societal expectations and technological advancements (Franks, 2021, 1).

Archivists operate within the historical and technological frameworks of their time, and their professional identity is shaped accordingly. The current information environment differs significantly from that of earlier archival practice. Although foundational functions such as appraisal, acquisition, arrangement, description, storage, access, and preservation remain integral to the profession, their implementation is now profoundly influenced by digital technologies and evolving societal demands. Furthermore, archivists must increasingly engage with domains traditionally considered external to archival practice, including cybersecurity, digital forensics, digital curation, cloud-based distributed systems, and decentralized trust technologies such as blockchain, all of which have a growing impact on archival activities. (Franks, 2021, 9). The archival profession must broaden its skills base to meet the demands of a rapidly evolving digital and organizational landscape. This expansion includes the integration of new competencies, particularly in digital technologies and entrepreneurial practices. While collaborative service models where a single professional supports multiple services may partially address these needs, they do not represent a comprehensive solution. Nonetheless, increased opportunities for collaboration with external institutions create valuable potential for skills exchange and the cross-pollination of professional knowledge and expertise. (DJS Research, 2015, 52). In the modern

digital era archivists must possess a thorough understanding of how information technologies are applied within the contexts of recordkeeping and records management. These two domains are interdependent and mutually reinforcing. Education and professional development in both areas should be grounded in a robust foundation of archival theory and methodology to safeguard the authenticity, reliability, and evidentiary integrity of archival records as documentation of decisions and actions (Eastwood, 1993, 458).

In the 21st century, technological innovation serves as a foundational driver across professional domains, including the field of archival management, where advancements in information technology play a central role. From a practical standpoint, these developments have led to new baseline expectations for archival institutions (Şentürk, 2021, 90).

4 AUDIOVISUAL ARCHIVISTS AND THE CHALLENGES OF DIGITAL TRANSFORMATION

Despite the transformative impact of the digital revolution manifested in the emergence of new file formats, storage media, and evolving requirements for long-term preservation the core functions of film archives have largely remained consistent. Archives continue to define their role as custodians of audiovisual heritage, with a mandate to manage, preserve, and provide access to their collections. Addressing the demands of this expanded mandate entails the adoption of new preservation and access strategies, infrastructural adaptations, and continuous professional development. Nevertheless, existing standards and accumulated professional experience can be effectively recontextualized and applied within the digital domain. The fundamental objective persists: to ensure the secure storage of archival holdings, the provision of adequate metadata for their description, and the facilitation of public access in appropriate and sustainable formats (Heftberger, 2014, 137).

Film archive personnel are increasingly required to develop and implement new metadata frameworks that enhance the description of their collections, support emerging forms of access such as online platforms and enable interoperability through data exchange with other institutions. Historically, such practices have not been widespread in film archives, often due to varying national and cultural

traditions. However, the previously rigid division of labor particularly the separation between technical and curatorial roles, is gradually becoming more fluid. Furthermore, new professional profiles are emerging within film archives, notably those of information specialists who operate in interdisciplinary capacities. These roles transcend traditional binaries such as analogue versus digital or film versus non-film, reflecting the evolving complexity and convergence of archival work in the digital era (Heftberger, 2014, 138). All organizations are increasingly confronted with the growing complexity of managing digital information. Addressing this challenge necessitates a reorientation of priorities and the development of relevant competencies across all administrative levels. It is essential to establish robust systems for the comprehensive capture, management, and long-term preservation of digital records to ensure that critical information remains accessible in support of the organization's operational and strategic functions (DCMS et al., 2009, 17).

5 STRUCTURAL CHANGES TO ARCHIVAL JOB ROLES IN THE DIGITAL ENVIRONMENT

Over the past fifteen years, audiovisual archives have been increasingly engaged in the digitization of analog holdings, the management of born-digital content, and the implementation of artificial intelligence (AI) tools in professional processing and access workflows. In 2013, RTV Slovenia updated its job classification scheme; however, this update did not sufficiently address the new competencies and responsibilities necessitated by digital archival processes.

The proposed revision of job classifications is based on the necessity of moving beyond traditional analog paradigms. Archivists must assume a proactive role in redefining the strategic significance of archives, archival institutions, and the professional identity of the archivist in the context of a rapidly evolving digital landscape. This requires abandoning introspective approaches in favor of collaborative models that enable sustainable and long-term management of archival materials (Millar, 2017, 60). The modern archivist's challenge lies not only in preservation but in responding to technological and societal changes through interdisciplinary knowledge and adaptable solutions (DCMS et al., 2009, 6).

5.1 ANALYSIS OF EXISTING ARCHIVAL JOB ROLES AT RTV SLOVENIA

Existing job positions in the audiovisual archive of RTV Slovenia are categorized based on the required level of education and the complexity of associated tasks. The current classification includes the following roles:

- RTV Archivist (Secondary technical education / Upper secondary): responsible for physical preservation of archival and documentary media, inspection and technical maintenance of materials, coding and cataloguing, preparation for use, and both technical and content-based inspection of returned materials. Tasks focus primarily on physical carriers such as film reels, videotapes, and Beta cassettes.
- Media Archivist VI (Short-cycle higher vocational education): responsible for receiving and storing audiovisual content on various carriers, classification and indexing, creating metadata records, and facilitating access to users. Tasks still involve handling physical carriers but also include preparing material for digitization.
- Media Archivist (Higher professional education): performs more extensive tasks, including acquisition of content on various carriers, evaluation and processing, classification, copyright clearance, preparation for long-term preservation, digitization, and access provision.
- Documentation Archivist (First-cycle professional higher education): leads archival and museum operations, oversees collection and management of museum materials, digitizes broadcasts, guides visitors through the archival exhibitions, collaborates on exhibitions and loans, and provides data to users. This role includes the responsibilities of the Media Archivist but also assumes curatorial and public engagement duties.
- Documentation Specialist – Information Officer (Second-cycle degree / master's degree): selects material for programming, processes archival data analytically, and prepares it for large-scale projects. The role focuses primarily on content curation and research support.
- Documentation Specialist – Researcher (Second-cycle degree / master's degree): occupies the highest level of archival work. Tasks include project-based research, acquisition of archival material, international and private collection verification, reproduction acquisition, and thematic research in archive and related fields.

The existing classification does not encompass responsibilities related to the use of LTO tape libraries, metadata frameworks, archival system operations, or AI supported processing. These areas form the core of the proposed updated model.

5.2 PROPOSAL FOR A MODERN CLASSIFICATION OF ARCHIVAL POSITIONS AT RTV SLOVENIA

To address contemporary professional needs comprehensively, we propose a new classification framework comprising seven levels of audiovisual archival positions. These levels are differentiated by educational requirements and the complexity of assigned tasks:

- Level I (Secondary technical education / Upper secondary): responsible for the physical safeguarding of materials, coding and cataloguing, preparation of materials for use and reintroduction into the archive, technical inspections, and maintenance. Includes keeping records and preparing status reports on archival holdings.
- Level II (Short-cycle higher vocational education): in addition to Level I tasks, responsible for the preparation and execution of basic digitization processes.
- Level III (Higher professional education): in addition to Level II tasks, perform digital acquisition, quality control of ingested materials, metadata creation (cataloguing, classification, indexing), content description, selection of materials for production and external users, and applies artificial intelligence tools.
- Level IV (First-cycle professional higher education/ First-cycle university degree): in addition to Level III tasks, responsible for the acquisition, selection, and appraisal of materials and ensuring user access.
- Level V (Second-cycle degree / master's degree): in addition to Level IV responsibilities, performs analytical and content-based metadata description, uses AI tools for selection and appraisal, facilitates user access, provides information on authors and performers, and guides archival visits and exhibitions.
- Level VI (Second-cycle degree / master's degree): in addition to Level V tasks, conduct research and select content for programming and external projects, collaborate with public and private institutions, prepares expert documentation, and processes requests from external users.
- Level VII (Second-cycle degree / master's degree): the most advanced level, includes responsibilities of Level VI along with drafting expert guidelines, or-

ganizing workshops and training, negotiating usage contracts, curating archival collections and systems, and participating in the procurement, implementation, and maintenance of archival applications.

5.3 PROPOSAL FOR TECHNICAL ARCHIVAL POSITIONS AT RTV SLOVENIA

The current technical job profiles do not adequately address tasks related to the digitization of archival material. To bridge this gap, we propose three levels of specialized technical positions:

- Technical Level I (Short-cycle higher vocational education/ Higher professional education): responsible for receiving, sorting, cataloguing, classifying, and indexing material for restoration and digitization. Tasks include basic conservation and restoration interventions, preparation for digitization, execution and quality control, and documentation of restoration and digitization processes.
- Technical Level II (First-cycle professional higher education/ First-cycle university degree): in addition to the tasks of Level I, participates in production projects involving digitized content and manages the organization of restoration and digitization procedures.
- Technical Level III (Second-cycle degree / master's degree): in addition to the responsibilities of Level II, monitors professional literature and the latest restoration and digitization methods, and collaborates with related institutions and archives domestically and internationally.

The proposed model ensures the alignment of archival practice with the demands of the digital era, broadens the required knowledge base, and supports long-term human resource planning. It emphasizes digital competencies, interdisciplinary collaboration, and the implementation of advanced technologies for audiovisual preservation and access.

6 CONCLUSION

The digital transformation of television archives encompasses the adoption and implementation of digital technologies within the fundamental workflows and strategic frameworks of audiovisual archiving. This shift facilitates improved preservation, greater accessibility, and more effective management of archival materials. It involves moving away from conventional, primarily analog practices toward digi-

tal systems, thereby enabling more streamlined storage, retrieval, and distribution of media content (Taurino & Aitaki, 2024, 4). Archivists must pursue continuous professional development through multiple established avenues, including formal education, technical training, the use of professional guidelines, and workshops that emphasize the enhancement of technical competencies. In parallel, a shift in mindset is required moving from traditional, paper-based approaches to practices aligned with electronic records management. To remain effective, archivists must demonstrate the capacity to adapt to ongoing technological advancements and integrate them into archival theory and practice (Rahmadanty et al., 2023, 207).

The proposed revision of the job classification system within RTV Slovenia's archival services directly addresses the emerging needs arising from the digital transformation of the television sector. Technological progress has significantly reshaped the field of archival science, introducing new responsibilities related to digital content management, artificial intelligence tools, and complex information systems.

Modern archival requirements must be divided into two primary domains within audiovisual archives: content-related tasks and technical tasks.

In the content domain, audiovisual archivists are increasingly responsible for managing metadata structures, applying AI in professional processing, understanding archival systems and applications, and contributing to the development and integration of archival and broadcast software solutions. Archivists are no longer merely custodians of material but active stakeholders in the planning, maintenance, and enhancement of archival infrastructures.

Simultaneously, there is a growing need for specialized technical profiles that combine elements of editing, production, and archival competencies. These professionals must master software tools for conservation, restoration, and digitization processes. Their roles support technical execution and ensure high-quality preservation of digital content in accordance with professional standards and long-term storage requirements.

In conclusion, the digital transformation of the archival field necessitates a comprehensive renewal of competence profiles, a redefinition of archival roles, and the adoption of modern approaches to managing audiovisual content, encompassing both professional and technical dimensions of archival work.

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ATLANTI+ GUIDELINES FOR AUTHORS

1. GENERAL INFORMATION ABOUT ATLANTI+

ATLANTI+ is an international scientific journal for modern archival theory and practice with an international editorial board, jointly published by the International Institute of Archival Science Trieste – Maribor (hereinafter MIAZ) and Alma Mater Europaea University, Slovenia.

The journal ATLANTI + is a peer-reviewed journal that publishes only original scientific articles and is published twice a year.

2. LANGUAGE

ATLANTI+ publishes scientific articles in English only.

3. FORMAT AND THE LENGTH OF CONTRIBUTIONS

The author should use Times New Roman font size 12.

The length of the article should not be shorter than 8 typed pages (or 15,000 characters with spaces) and should not exceed 16 typed pages (or 30,000 characters with spaces) including tables, figures, and a list of references.

4. STRUCTURE

The article should contain an abstract and keywords in English and in the author's native language (if the article is written in the author's native language).

Information about the author of the article should be provided before the title of the article. It shall include the first and the last of the author. Also needed are any academic and professional titles, the institution where the author works or is studying, the address and the email address at which the author can be reached by the editors and readers of the journal. The author should also include a short biography.

If there are several authors, they should come to an agreement and determine the order.

- **The title (subtitle)** should be short, concise, and informative, accurately defining the content of the article. Any subtitle must be separated from the title by a comma. The title and subtitle should use words that are suitable for indexing and searching.
- **The abstract** is a mandatory component of the article and must be compiled according to the IMRAD structure in accordance with ISO 214. The abstract should not exceed 250 words and should be written in the third person. The abstract should clearly define the purpose, design, methodology and approach, findings and results of the article, limitations as well as applicability and conclusions of the research. The author should specify up to 5 keywords or phrases that will be suitable for indexing and searching.

  Example:

  Abstract

  Purpose: Archival science and Museum science in museums are working in close cooperation. In the process of…

  Method/approach: The method used in our paper is case study, with which we demonstrated the usefulness of archival science in museums in practice…

  Results: Description of archival records has an important role in museum archives and storage rooms, since it allows employees to…

  Conclusions/findings: Museum and Archival science work closely together in museums and they need each other… Due to this, it is possible for the archivist and curator documentarist to look for common solutions in the field of record/documentation management and storage.

  Keywords: *archival science, museum science, museum, museum storage room.*
- **Main text** of the article (minimum 15.000, maximum 30.000 characters with spaces) is followed by the reference list and summary in English. It should be written in Times New Roman 12p. Paragraph levels should reflect the organization of the article. Chapters can be divided into subchapters. Numbering should follow SIST ISO 2145 and SIST ISO 690 standards (that is: 1, 1.1, 1.1.1 etc.).
- **Reference list** follows the main text and it must include all used sources cited in article. Authors must use APA style.
- **Summary** should contain at least 500 words written in English due to the international presence of Atlanti Journal.

5. FOOTNOTES

Footnotes are placed at the bottom of the page and numbered with ordinal numbers from the beginning to the end of the article. **Footnotes should provide additional text (author‘s comments) and not bibliographic references - those can only be referred to**. If the footnote refers to the whole sentence or paragraph, it is placed after the punctuation mark. If it refers to the last part of the sentence or only to the last word, it should be placed before the punctuation mark.

6. PICTORIAL AND GRAPHIC MATERIAL

The contribution may contain pictorial and graphic material and tables.

Each of them should be consecutively numbered from the beginning to the end of the text (Table 1, Table 2, Figure 1, Graph 1, Figure 2...).

Every table, spreadsheet, figure, graph must have a title. Titles of tables, charts and graphs should be written above it. Appropriate explanations (legend) should be added to the tables. The titles of the pictures should be written below the picture.

If the pictorial and graphic material is not the result of the author’s work, the source from which the data was obtained must be indicated. Images must be scanned in a suitable resolution (at least 300 dpi) in .jpg, .tiff or .png format. **These sources should also be listed in the bibliography.**

7. CITATION OF AUTHORS AND REFERENCES

Authors should use the APA Style and in-text citation for citing sources. More detailed examples are shown in the table in Annex 1

KEY CITATION GUIDELINES:

- Only publicly available sources should be cited.
- When citing in the text, the **last name of the author(s), the year of the source and the page number(s)**, separated by a comma, must be given
  (Carruci, 2006); Semlič Rajh (2018, 43) thinks...…
- Sources, cited as the example, shall be cited as below.
  (see Klasinc, 1999 or Ratti, 2001), (for more, see Johnsonn, 2006)
- To cite secondary sources, the author(s) and the year of the primary source are

cited, followed by the author(s) and year of the secondary sources.

(Line, 1979, as cited in Mihalič, 1984)

- When the source has no author or editor, the title of the source is given, followed by the year of publication.
(*Merriam-Webster's*, 2003).
- Verbatim citations should be marked with quotation marks (“ “) and page numbers, and the text should be in italics.
- In this case, this newly created material also becomes heritage, because *“similarly to analogue cultural heritage, it goes through the processes of creation, evaluation, collection, documentation, communication and permanent preservation”* (Šojat-Bikić, 2013, 151).

KEY GUIDELINES FOR CITING SOURCES IN THE “REFERENCES” CHAPTER

- The **Reference** chapter should only contain sources that are used and cited in the text. All information should be provided in the original language, unless provided in Cyrillic. In this case, the author should indicate the source in parentheses, also in Latin).
- If the sources used are from the same author and published in the same year, they are separated by the letters a, b, c... They should also be cited in the text in this way.

(Novak, 2002a, 2002b), Novak (2002a, 2002b) presents . . .

- If the source used is still in print or has not yet been published, this is indicated where the year is usually given.
- For citation of sources accessible online, the above instructions shall used sensibly. However, it is necessary to add “Retrieved at” and an online link to the source or a doi link, followed by the date of access in brackets (e.g. (accessed on 15/05/2022).

8. SUBMISSION AND COPYRIGHT

The author can submit contributions that have not yet been published in another publication or are not in the process of being published in other publications. The author is fully responsible for the content of the article and the proofreading of the text. The contribution for publication should be compiled in accordance with the journal's instructions and scientific guidelines regarding the content, style, and structure of the article.

The author should send a grammatically and linguistically suitable text to the editors. **Texts that do not comply with the journal's instructions will be returned to the author by the editors and will require adjustments and corrections.**

The editor and technical editor review the appropriateness of citations and references in accordance with the journal's guidelines and decide whether:

a) the article can be sent to the review process,

b) return the article to the author and request appropriate modifications and only then forward the article for peer review.

All moral and copyright rights in case of publication belong to the author. In case of material copyrights, these are transferred to the publisher of the magazine - the International Institute of Archival Sciences Trieste - Maribor and Alma Mater Press by the author for all time, for all cases, for unlimited editions and for all media, non-exclusively, temporally and spatially. The author signs the permission to publish the article in Atlanti+ magazine, which must be submitted when submitting the article.

The author submits the article together with a signed permission to publish the article in electronic form to the email address of the journal's editorial office (if there are several authors, the permission must be signed by all authors).

9. PEER REVIEW PROCEDURE:

The editorial board reviews all received submissions. If the articles are not prepared in accordance with the instructions and standards of the journal, the editorial board requests corrections and adjustments from the author. If the article is neither scientific nor professional, the editorial committee decides on publishing it or not.

Scientific and professional articles that have been written in accordance with the instructions and guidelines of the journal and the editors are included in the anonymous (double-blind) peer review process. Reviewers are selected by the editorial board.

The following components are looked at by the editorial board:

- **content**: general interest of the content, innovation...,
- **methodology**: adequacy of used methods, sampling, confirmation/rejection of hypotheses and assumptions...,
- **the structure and form of the contribution**,
- **consistent citation and citing of sources, notes, pictorial and graphic sources**...

According to the reviewer, the author either corrects or adjusts the article.

Anonymity of authors and reviewers during the review process is guaranteed. Articles will only be published if they have received a positive evaluation during the review process.

After the review, the reviewer determines the typology of the article and decides whether the article:

a) May be published as submitted to the editors,

b) Can be published after the author has made minor required corrections,

c) Needs to be corrected and sent to the editorial board for another review,

d) Unsuitable for publication.

10. TYPOLOGY

Based on the reviewer's opinion, the editorial board determines the typology of the article. The typology for managing bibliographies within COBISS is as follows:

1.01 Original scientific article

1.02 Review article

1.03 Short scientific article

1.04 Professional article

11. FINAL TEXT AND PUBLISHING PREPARATION

The author must send the final text via e-mail (in MS Word format) within the deadline set by the editors to the editors' e-mail address.

The editorial board prepares the text for publication and reserves the right to change the format of contributions and major design changes in agreement with the author.

The reviewers consider the following:

- Content: general interest, innovation …,
- Methodology: suitability of used methods, sampling, hypothesis confirmation or rejection.
- Paper structure,
- Citations and references: citing consistency, references etc...

According to the reviewer's opinion the author corrects or supplements the article.

The anonymity of authors and peer reviewers during the review procedure is guaranteed. Articles are published only if they receive a positive review.

EXAMPLES OF CITING SOURCES

The table contains examples of citing sources for easier illustration of citing each type of source in different formats for a contribution in Atlanti+ journals:

- The first column indicates the source type.
  The list of used sources must be placed at the end of the article; the sources must be listed as shown in the second column (titles books/magazines/documents are written in italics - see the individual case)
- Explanations and more important highlights are written in the third column.
- The fourth column shows how each type of source should be cited within the text (e.g. Melik (1995, 15) notes that...; Stoler et al. (2020) claims..., (Vilfan and Žontar, 1973, 154) etc.)

BOOK Surname, first name. (year). Book Title: Subtitle. Place of publishing: Publishing house. Surname, first name. (ed.). (year). Book Title: Subtitle. Place of publishing: Publishing house.		Write the title (and subtitle) of the book in italics. In the case of two or more authors, we add the word „and“ before the last author.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Book One author	Melik, J. (2011). Osnove prava in pravne države za arhiviste. Ljubljana: Arhiv Republike Slovenije.		(Melik, 1995);
Book Two authors	Vilfan, S. and Žontar, J. (1973). Arhivistika. Arhivski priročniki: zvezek 2. Ljubljana: Arhivsko društvo Slovenije.		(Vilfan and Žontar, 1973)
Book Three or more authors	Stoler, A. L., Gourgouris, S. and Lezra, J. (2020). Thinking with Balibar: A Lexicon of Conceptual Practice. New York: Fordham University Press.	**Three authors:** For the first citation in the text, write down the surnames of all authors, for all subsequent citations only the first author and add “et al.” (the international abbreviation for “and others”). **More than three authors:** When citing a source, write down all authors in the list of sources used. When citing in the text, write down the last name of the first author and add „et al.“.	(Stoler et al., 2020)
Book With editor(s)	Žontar, J. (ed.). (2000). Pravo, zgodovina, arhivi. 1. Prispevki za zgodovino pravosodja. Ljubljana: Arhiv Republike Slovenije.	In the list of sources, instead of the authors, we indicate the editor(s) and add an explanation in parentheses that they are the editors: „(ed.)“. When citing in-text tags, with the remark editors, “ed.” is not added.	(Žontar, 2000)
Book Without author/ editor	Publication manual of the American Psychological Association (6th ed.). (2010). Washington: American Psychological Association.	In the text, we cite the first few words of the citation in the list of sources used (usually the beginning of the title or the entire title). When quoting in the text, write the title or the beginning of the title in quotation marks.	(Publication manual, 2010
Annual report of an organisation	Vrhovno sodišče Republike Slovenije. (2020). Otvoritev sodnega leta 2020. Ljubljana: Vrhovno sodišče RS.	If it is information about an organization or its work, the author can be just the organization itself.	(Vrhovno sodišče RS, 2020)
Dictionary Large number of authors/editors	Slovar slovenskega knjižnega jezika [SSKJ]. (1994). Ljubljana: DZS.	In the text, we cite the first few words of the citation in the list of sources (usually the beginning of the title or the entire title)	(SSKJ, 1994)
Thesis	Kosi, M. (2016). Izhodišča za invalidom uporabno digitalizirano arhivsko gradivo (Master thesis). Ljubljana: Fakulteta za varnostne vede.		(Kosi, 2016)

ELECTRONIC BOOK Surname, first name. (year). E-Book Title: Subtitle. Place of publishing: Publishing house. Retrieved at http://xxxxxxxxxxx (accessed date of access). Surname, first name. (year). E-Book Title: Subtitle. Place of publishing: Publishing house. doi:xxxxxx/xxxxxxxxxxx (accessed date of access).		We cite them in the same way as printed books, except that we add a web link or a doi mark after the bibliographic data. The web link and the doi (Digital Object Identifier) must be written in bold, not underlined. Examples of citing sources for different numbers of authors are explained in the examples for books.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
E-book	Stichelbaut, B. (2015). Forgotten and lost? : 1914-1918 : a guide to the archives : archival research of aerial photographic collections of the western front. Ljubljana: Založba ZRC. Retrieved at http://www.dlib.si/details/URN:NBN:SI:doc-HO-1BAQNR (accessed on15. 2. 2022).	For bibliographic data and phrase „retrieved at“ we add a web link.	(Stichelbaut, 2015)
E-book with DOI	Stalla-Stichelbaut, B. (2015). Forgotten and lost? 1914-1918 : a guide to the archives : archival research of aerial photographic collections of the western front. Ljubljana: Založba ZRC. Doi: 10.3986/9789612548315 (accessed on 7. 4. 2022).	After the bibliographic data, we add “doi:” and the appropriate label..	(Stichelbaut, 2015)
Annual report of an organisation in e-form	Vrhovno sodišče Republike Slovenije [VS RS]. (2019). Letno poročilo o poslovanju sodišča za leto 2019. Ljubljana: Vrhovno sodišče Republike Slovenije Retrieved at http://www.sodisce.si/mma_bin.php?static_id=2020042009043956 (accessed on 27. 2. 2020).	If it is information about an organization or its work, the author can be the organization itself. If the name of the organization is long and the source is cited several times in the text, an abbreviation can be introduced in the first citation, which is then used in all subsequent citations. The abbreviation must also be given next to the name of the organization in the list of used resources.	(VS RS, 2019)
E-dictionary or encyclopaedia	Fran: Slovarji Inštituta za slovenski jezik Frana Ramovša ZRC SAZU. (2016). Ljubljana: Inštitut za slovenski jezik Frana Ramovša ZRC SAZU. Retrieved at http://www.fran.si/ (accessed on 2. 2. 2022).	When quoting in the text, write the title or the beginning of the title in in quotation marks.	(Fran, 2016)
E-version of a thesis	Pfajfar, V. (2018). Digitalizacija arhivskega gradiva. Metodologija in standardizacija postopkov (Magistrsko delo). Logatec: Alma Mater ECM. Retrieved at: https://d.cobiss.net/repository/si/files/2013301/106382/Pfajfar_Vanja_md_2018.pdf/terms (accessed on 6. 2. 2023).		(Pfajfar, 2018)

BOOK CHAPTER Surname, first name. (year). Chapter Title: Subtitle. In Initial of editor's name. Surname of the editor (ed.), Title of the book: Subtitle (pgs. first page of chapter - last page of chapter). Place of publishing: Publishing house.		In the list of sources used, the authors, year and title of the chapter are listed first. Then, after the word "In" (it stands for the introductory phrase, to indicate where the chapter is published), we provide information about the book and the pages on which the chapter is published. Write the title (and subtitle) of the book in italics. Examples of citing and citing sources for different numbers of authors are explained in the examples for books.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Chapter in a book With editor(s)	Melik, J. (2000). Organizacija rednih sodišč v prvi Jugoslaviji. In J. Žontar (ed.), Pravo-zgodovina—arhivi: 1. Prispevki za zgodovino pravosodja (pgs. 173–183). Ljubljana: Arhiv Republike Slovenije.		(Melik, 2000)
Article in conference proceedings With editor(s)	Semlič Rajh, Z. (2018). Standard ISO 15489-1:2016 in vrednotenje : kaj prinaša novi standard. V A. Škoro Babič (ur.), 6. Simpozij Arhivi v službi človeka - človek v službi arhivov, (pgs. 43–51). Maribor: Alma Mater ECM.		(Semlič Rajh, 2018)

ARTICLE IN ELECTRONIC PROCEEDINGS Surname, first name. (Year). Article title: Subtitle. In Initial of editor's name. Last name of the editor (ed.), Title of the e-collection: Subtitle (pgs. First page of the chapter - last page of the chapter). Place of publishing: Publishing house. Retrieved at http://xxxxxxxxxxxx (accessed on date of access).		Write the title (and subtitle) of the collection in italics. We cite them in the same way as printed chapters, except that we add a web link or a doi tag after the bibliographic data. The web link and the doi (Digital Object Identifier) must be written in bold, not underlined. Examples of citing sources for different numbers of authors are explained in the examples for books.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Contribution in the e-proceedings of the conference with the editor(s); pages of the article in the e-proceedings are indicated	Jelenc, Bogomil. 2017. Elektronsko pisarniško poslovanje, prvi korak k elektronskemu arhiviranju. In N. Gostenčnik (ed.), Tehnični in vsebinski problemi klasičnega in elektronskega arhiviranja. Digitalno in digitalizirano. Arhivsko gradivo včeraj, danes in jutri : zbornik mednarodne konference, Radenci, 5.-7. april 2017, Radenci, April 5-7, 2017 (pgs. 305-316). Maribor: Pokrajinski arhiv Maribor. Retrieved at http://www.pokarh-mb.si/uploaded/datoteke/Radenci/radenci_2017/22_jelenc_2017.pdf (accessed on 15. 9. 2022).	For bibliographic data and phrase "Retrieved at" we add a web link. The link must be written in black font and not underlined. If the pages in e-proceedings are numbered, we list those pages, too.	(Jelenc, 2017)
Contribution in the e-proceedings of the conference no editor; contribution pages in the e- are not listed in the proceedings	Huth, G. (2016). Appraising Digital Records. In Appraisal and Acquisition Strategies: Proceedings of the 10th Inter- national Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management. London: SCITEPRESS. Retrieved at https://dokumen.pub/appraisal-and-acquisition-strategies-9780931828003-0931828007.html (accessed on 24. 10. 2022)	The editor is not listed, so this information is not included in the citation. The pages are not listed in the e-proceedings, so this information is not available.	(Huth, 2016)

ARTICLE IN A PRINTED MAGAZINE/JOURNAL/ DAILY NEWSPAPER Surname, first name. (year/date). Article Title: Subtitles. Title of magazine/journal, year (issue), first page of the article - last page of the article.		In the list of sources, the authors, year and title of the article are listed first. Then we state the title of the magazine/journal, the year, the number and the pages, where the article is published. Write down the title and year of the magazine/journal in italics. For the titles of magazines/ journal in English, we capitalize all words except prepositions and conjunctions. This does not apply to titles of books and articles in English. Examples of citing sources for different numbers of authors are explained in the examples for books.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Article in printed journal with the year and the number.	Košir, M. (2002). Arhivistika – pot do samostojne znanstvene discipline. Arhivi, 25(1), 295–301.	Write down the title and year of the journal in italics; write the magazine number in brackets.	(Košir, 2002)
Article in printed journal with the year and without the number.	Žontar, J. (1995). Zgodovina arhivistike na Slovenskem. Arhivi, 18. 13–17.	Write down the title and year of the magazine in italics.	(Žontar, 1995)
Article in printed journal without the year and without the number	Eastwood, T. (2002). Reflections on the Goal of Archival Appraisal in Democratic Societies. Archivaria (54), 59–71.	Write the title of the magazine in italics; write the magazine number in brackets.	(Eastwood, 2002)
Article in daily newspaper	Petrovec, D. (16. 1. 2017). Vrhunska znanost in črn otrok. Dnevnik, 67(12), 14.	In the list of sources, we indicate the exact date of the article; when quoting in the text, we mention only the year	(Petrovec, 2017)
An article in a daily newspaper without an author	Pomisleki glede prodaje NLB. (30. 3. 2017). Dnevnik, 67(74), 3.	In the list of sources, we indicate the exact date of the article; when citing in the text, only the year is mentioned. In the text, we quote the first few words of the citation in the list of sources (usually the beginning of title or full title). When quoting in the text, write the title or the beginning of the title in quotation marks.	(»Pomisleki glede prodaje NLB«, 2017)

ARTICLE IN THE ELECTRONIC VERSION OF THE JOURNAL/DAILY NEWSPAPER Surname, first name. (year/date). Article Title: Subtitles. Title of journal/daily newspaper, year (issue), first page of the article - last page of the article. Retrieved at http://xxxxxxxxxxx (accessed on date of access). Surname, first name. (year/date). Article Title: Subtitle. Title of magazine/magazine, year (issue), first page of the article - last page of the article. doi:xxxxxx/xxxxxxxxxxxx (accessed on date of access).		We cite them in the same way as articles in printed journals, except that we add a web link or a doi tag after the bibliographic data. The web link and the doi (Digital Object Identifier) must be written in bold, not underlined. Examples of citing sources for different numbers of authors are explained in the examples for books..	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Article in the electronic version of the journal	Duranti, L. (2010). Concepts and principles for the management of electronic records, or records management theory is archival diplomatics. Records Management Journal, 20(1), 78–95. Retrieved at: http://dx.doi.org/10.1108/09565691 011039852 (accessed on 13. August 2022).	For bibliographic data and phrase „Retrieved at“ we add a web link. The link must be written in black font and not underlined. Follow the access date in parentheses for the link. Write the title of the magazine in italics.	(Duranti, 2010)
Article in the electronic version of the journal with DOI	Flynn, S. J. (2001). The Records Continuum Model in Context and its Implications for Archival Practice. Journal of the Society of Arhivists, 22(1), 79–93. Retrieved at: https://doi.org/10.1080/00379801 20037522 (accessed on 31 July 2022).	After the bibliographic data, we add „doi:“ and the appropriate label. (doi – Digital Object Identifier) Write the title of the magazine in italics.	(Flyn, 2001)
Article in the electronic daily newspaper	Suhodolčan, B. (8. 3. 2023). (Pismo Bralca) Sončne elektrarne in cena električne energije. Večer. Retrieved at https://vecer.com/pogledi/pismo-bralca-soncne-elektrarne-in-cena-elektricne-energije-10328522 (accessed on 10. 3. 2023).	In the list of sources, we indicate the exact date of the article; when citing in the text, only the year. Write the address of the online newspaper in italics	(Suhodolčan, 2023)
Article on the online information portal	Širok, M. (6. 3. 2023). EU odločanje o prepovedi prodaje vozil z motorji na notranje izgorevanje preložil na nedoločen čas. MMC RTV Slovenija. Retrieved at https://www.rtvslo.si/evropska-unija/eu-odlocanje-o-prepovedi-prodaje-vozil-z-motorji-na-notranje-zgorevanje-prelozil-na-nedolocen-cas/660104 (accessed on 8.3.2023).	In the list of sources, we indicate the exact date of the article; when citing in the text, only the year is mentioned. We write the address of the information portal in italics, which we state as it is written on the website - do not copy the start of an online connection.	(Širok, 2023)
Article on the online information portal, author indicated by abbreviation	B. V. in K. S. (8. 3. 2023). ZN: Afganistanke najbolj zatirane ženske na svetu. MMC RTV Slovenija. Retrieved at https://www.rtvslo.si/svet/zn-afganistanke-najbolj-zatirane-zenske-na-svetu/660403 (accessed on 9. 3. 2023).	The abbreviation given as the author, is listed and cited in the order in which it is written with the article. In the list of sources, we indicate the exact date of the article; when quoting in the text, we mention only the year.	(B. V. in K. S., 2023)

Password in the dictionary, encyclopaedia on the website	Institut za slovenski jezik ZRC SAZU [Fran]. (2022a). Hibrid. Retrieved at: https://fran.si/iskanje?View=1&Query=hibrid (dostop 20. 1. 2022). Institut za slovenski jezik ZRC SAZU [Fran]. (2022b). Teorija. Retrieved at: https://fran.si/iskanje?FilteredDictionaryIds=130&View=1&Query=teorija (accessed on 3. 9. 2022).	When citing entries from dictionaries or encyclopaedias, we use the institution that published the dictionary/encyclopaedia as the author, and indicate the year in parentheses. For Internet resources, we use the year of the last website update. If we have several passwords and the same year, separate them with a, b, c. We write the title of the password in italics.	(Fran, 2022a) (Fran, 2022b)

OFFICIAL AND OTHER SOURCES			
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Law/Act official publication in the Official Gazette of the Republic of Slovenia	Zakon o varstvu dokumentarnega in arhivskega gradiva ter arhivih (ZVDAGA). (2006, 2014). Uradni list RS, (30/06, 51/14).	In the list of sources used, we indicate the original law with all amendments (year and number of the published amendment). When quoting in the text, we write only the year of the original law/act. If we quote the law/act in the text several times, we can also decide to use an abbreviation. Write „Uradni list RS“ (“Official Gazette of RS”) in italics.	(ZVDAGA, 2006)
Law/Act official publication in the Official Gazette of the Republic of Slovenia with officially revised text and changes	Kazenski zakonik (KZ-1-UPB2). (2012, 2015, 2016). Uradni list RS, (50/12, 54/15, 6/16, 38/16).	In the list of sources used, we indicate the year and number of the publication of the officially revised text and all changes published after this publication (year and number of the published change). When quoting in the text, we write only the year of the officially revised text. If we quote the law/act in the text several times, we can also decide to use an abbreviation. Write „Uradni list RS““(“Official Gazette of RS”) in italics.	(KZ-1-UPB2, 2012)
Amendments and additions to the law/act official publication in the Official Gazette of the Republic of Slovenia	Zakon o spremembah in dopolnitvah Zakona o varstvu dokumentarnega in arhivskega gradiva ter arhivih (ZVDAGA--A). (2014). Uradni list RS, št. 51/14.	If we want to note in the text when exactly a certain change in the law/act was adopted (e.g. amendment of one of the articles), we must quote and cite exactly this amendment to the law/act.	(ZVDAGA-A, 2014)
Law in book form usually with commentary by the group of authors	Pirc Musar, N., Bien, S., Bogataj, J., Prelesnik, M. in Žaucer, A. (2006). Zakon o varstvu osebnih podatkov (ZVOP-1): S komentarjem (with commentary). Ljubljana: GV založba.	We cite the law/act in book form only if we cite a published commentary in the text.	(Pirc Musar et al., 2006)
Court decision/ sentence	Ustavno sodišče RS. (2014). Odločba št. U-I-70/12 z dne 21. 3. 2014. (The Constitutional Court of the Republic of Slovenia. (2014). Decision no. U-I-70/12 of 21 March 2014.)	When citing a decision/sentence of the court in the list of sources, it is not written in italics texts.	(Ustavno sodišče RS, 2014) (Constitutional court of RS, 2014)
Standard	International Organization for Standardization (ISO). 2016. ISO 15489-1:2016: Information and Documentation - Records Management. Part 1: Concepts and Principles.		(ISO 15489-1:2016)

OTHER ELECTRONIC PUBLICATIONS		When stating the year or the date of the source in parentheses, we never state the date of accessing the source from the Internet, but the information about the publication of the source or its last change. If this information is not available, instead of the year we write the abbreviation „n.d.“, which means „no date“, in brackets.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Website/subpage of the organization without year or date of publication	Government of the Netherlands (s. d.). About the government. Retrieved at https://www.government.nl/government/about-the-government (accessed on 5. 1. 2023).	If it is information about an organization or its work, the author can be the organization itself. If there is no information about the year of publication or the last change of the website, we use the abbreviation “n. d.”. The title on the website is written in italics.	(Government of the Netherlands, n. d.)
Website/subpage of the organization with the year of publication indicated	Vrhovno sodišče Republike Slovenije [VS RS]. (2020). Pravilnik o hrambi spisov in drugega dokumentarnega gradiva. Retrieved at https://www.sodisce.si/mma_bin.php?static_id=2020110511401387 (accessed on 5. 3. 2021).	If it is information about an organization or its work, the author can be the organization itself. In parentheses, we indicate the year of the last modification of the website, which is indicated at the bottom of the page. Write down the online title in italics. If the name of the organization is long and the source is cited several times in the text, an abbreviation can be introduced in the first citation, which is then used in all subsequent citations. The abbreviation must also be given next to the name of the organization in the list of used resources.	(VS RS, 2020)
Website/subpage of the organization with the indicated publication date	Ministrstvo za kulturo. (7. 3. 2023). Kultura za prihodnost: serija posvetov o viziji kulturne politike. Retrieved at https://www.gov.si/novice/2023-03-07-kultura-za-prihodnost-serija-posvetov-o-viziji-kulturne-politike/ (accessed on 9. 3. 2023).	If it is information about an organization or its work, the author can be the organization itself. In the list of sources, we indicate the exact date of publication; when citing in the text, only the year is mentioned. Write down the online title in italics.	(Ministrstvo za kulturo, 2023)
Online video (such as. YouTube)	International Council on Archives [ICA]. (1. 3. 2022). Artificial Intelligence in Archival Appraisal & Selection Webinar - Day 2 [Video]. Retrieved at https://www.youtube.com/watch?v=VOAiLS3CQ_k (accessed on 15. 5. 2022).	We add an explanation of what kind of source it is in square brackets after the title. In the list of sources, we indicate the exact date of the publication; when citing in the text, only the year is mentioned.	(ICA, 2022)
Online presentation	Duranti, L. (5. 10. 2015). Archival Diplomatics of Digital Records [Presentation]. Retrieved at http://www.interpares.org/display_file.cfm?doc=ip1-2_canada_dissemination_ls_duranti_um_2010.pdf (accessed on 9. 6. 2021).	In square brackets after the title, we add an explanation of what kind of source it is. In the list of sources, we indicate the exact date of publication; when citing in the text, only the year is mentioned.	(Duranti, 2015)

ARCHIVAL MATERIALS Title of the document. (time of creation of the document). signature and fund or collection, technical unit number, name of institution or archive.			
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Archival material in physical form	Poročilo o sodni stavki. (15. 3. 1923). SI_ZAC/0609 Okrožno sodišče Celje, a. š. 15. Zgodovinski arhiv Celje.	In the list of sources, we indicate the exact date of publication; when citing in the text, only the year is mentioned	(Poročilo o sodni stavki, 1923)
Archive material in digital format (or available in digital format)	Poročilo o sodni stavki. (15. 3. 1923). SI_ZAC/0609 Okrožno sodišče Celje, a. š. 15, Zgodovinski arhiv Celje. Retrieved at https://vac.sjas.gov.si (accessed on 15. 2. 2023).	In the list of sources, we indicate the exact date of the publication; when citing in the text, only the year is mentioned	(Poročilo o sodni stavki, 1923)

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