Adoption of artificial intelligence to enhance records management practices at Gauteng Department of Education in South Africa

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Abstract

Purpose – This study aims to examine the adoption of artificial intelligence (AI) to enhance records management practices at the Gauteng Department of Education (GDE) in South Africa.

Design/methodology/approach – The study used a convergent mixed-methods research approach, employing interviews and questionnaires for data collection. Analysis of the collected data involved both verbatim and statistical methods, and the results were presented through tables and figures.

Findings – The study revealed that AI can proficiently and effectively execute all records management practices across the entire records lifecycle.

Originality/value – Consequently, the study proposed a framework that can be used as a guiding tool for the implementation and use of AI. This framework aims to enhance records management processes, not only within the GDE but also within the broader archives and records management industry.

Keywords Artificial intelligence, Robotic machines, Cobotic machines, Records management, Gauteng Department of Education (GDE)

Paper type Research paper

Introduction and background of the study

The prevalence of Fourth Industrial Revolution (4IR) technologies, such as robotic machines and artificial intelligence (AI), often overshadows human intelligence (HI). Nevertheless, the primary focus of the Fifth Industrial Revolution (5IR) is centered on prioritizing the restoration of human skills and intelligence within the industrial framework (George and George, 2020; Noble *et al.*, 2022). The 5IR can be defined as an era that aims to establish a synergetic collaboration between humans and technology for mutual benefit (Costa *et al.*, 2022; Adel, 2022). In the context of this study, AI emerges as the leading technology, especially in the service delivery frameworks of corporations and organizations. AI, as referred to in this study, encompasses programmed robotic machines and AI-powered computer programs capable of automatically performing records management activities more efficiently and accurately than humans (Modiba, 2021).

Records management constitutes an integral aspect of an organization's operations. As outlined by Landau (2022) and Mahr (2022), effective records management involves overseeing records throughout their entire life cycle. This encompasses ensuring that the creation, storage, maintenance, preservation, access, retrieval and disposal processes of records are handled with efficiency (Mahr, 2022; Matlala and Maphoto, 2020). Diligent care and management of records across their life cycle prove beneficial in upholding accountability, transparency and facilitating effective decision-making. Additionally, it aids in managing potential risks and maintaining proper administration (Kirvan, 2023; Mosweu and Rakemane, 2020; Maina, 2020; Ngoepe and Ngulube, 2012; Netshakhuma and Makhura, 2022).

Research indicates that AI holds the potential to execute all records management practices with effectiveness and efficiency throughout the records lifecycle. This suggests that AI can address the current limitations within the GDE's records management system. By using AI-powered robotic machines, paper-based records can be seamlessly digitized and categorized according to the GDE file plan using advanced AI algorithms. These robotic machines, driven by AI, can further ensure the secure transfer of these digitized records to the cloud, providing unlimited and protected storage capacity. Accessing these records becomes effortless from any location through laptops, desktops, or smartphones.

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Moreover, AI-powered robotic machines play a pivotal role in safeguarding the security and integrity of the records (Modiba, 2021; Modiba *et al.*, 2019; Modiba *et al.*, 2023; Ripcord Company, 2019).

Hence, this study investigates the records management activities that can be performed through AI at the Gauteng Department of Education (GDE). The study made use of the concepts of the Technology Acceptance Model, Digital Transformation, record lifecycle and records continuum to develop AI and records management framework for effective and efficient records management.

Context of the study

The GDE is entrusted with the responsibility of delivering primary and secondary education in the Gauteng Province of South Africa. Its operational framework is aligned with the National Development Plan (NDP) and the Medium-Term Strategic Framework (MTSF), along with the Provincial Strategy known as "Growing Gauteng Together 2030" (GGT2030) as outlined in the GDE Annual Report for the year 2021 / 2022. As per the South African Constitution (Act 108 of 1996), the GDE is mandated to provide fundamental education to all learners within Gauteng, emphasizing the transformation and democratization of the education system while upholding principles of human dignity, equality, human rights, freedom, nonracism and nonsexism (The Constitution of the Republic of South Africa, 1996). In accordance with the South African Schools Act No. 84 of 1996, public schools are obligated to admit learners and address their educational requirements without engaging in any form of unfair discrimination (The South African Schools Act 84 of 1996, 1996). Guided by these principles, the vision of the GDE is to ensure that every learner in Gauteng excels academically, departing from our institutions equipped with the knowledge, skills and qualifications essential for success in adult life. Concurrently, the department's mission is dedicated to guaranteeing the occurrence of quality learning and teaching within the classroom on a daily basis. Hence, this study is conducted to adopt AI to improve the records management practice to GDE.

Literature review

This section presents a thorough literature review for the study, concentrating on the exploration of activities associated with records management and the application of AI in executing these records management tasks. The spectrum of records management activities encompasses the creation, storage, maintenance, use and disposal of records, as delineated by Kirvan in 2023.

Records management activities

Records management activities encompass the systematic and planned processes used in overseeing an organization's records throughout their lifecycle (International Records Management Trust, 2006). These activities involve the creation, capture, organization, classification, storage, access, retrieval and disposal of records in a manner that preserves their value and utility over time.

Record creation

The initial phase in a record's lifecycle is its creation. Records come into existence as a by-product of public administration, serving as evidence of transactions (Ngezana and Muchaonyerwa, 2019; Efe, 2022). They can manifest in various forms, including printed reports, emails, phone messages, policies and internal memos. Effective records management, starting from the creation stage, ensures the generation of necessary records while minimizing unnecessary ones (Mureebe and Lwanga, 2023). However, electronic records demand prompt recording and preservation due to the potential obsolescence of hardware and software. Neglecting any aspect of an electronic record's life cycle can jeopardize its integrity (Pharma, 2019; Matlala *et al.*, 2022).

Record classification

Records classification is the procedure of assigning records to their suitable location within a sequential allocation, facilitating their retrieval. As outlined by Ngoepe and van der Walt (2010), a records classification system or file plan aids an organization in understanding the existence and whereabouts of records, enhancing accessibility. Marutha (2021) underscored that classification stands as a pivotal operational function in records management. To ensure straightforward access and retrieval, records are classified based on their connection to the functions that gave rise to them.

Record storage

When records are housed in registries, the designated office space must be adequate to accommodate potential increases in records and files (National Archives and Records Service of South Africa (NARSSA), 2006). For paper-based records, storage facilities should be clean, dry and shielded from natural elements such as moisture and sunlight. It is essential to maintain optimal temperature and humidity levels to prevent damage to the records (Brown University Library, 2020). Conversely, electronic records require storage on stable media and in readable software formats. Implementing robust security measures is crucial for electronic records to prevent unauthorized access by cybercriminals. Encrypting electronic records can serve as a protective measure against threats, ensuring the security of clients' sensitive information (Brown University Library, 2020; Aransiola, 2023; Bennett, 2019).

Preservation of records

Preservation of records refers to the process of safeguarding and maintaining records over time to ensure their accessibility, accuracy and authenticity (Rutta and Ndenje-Sichalwe, 2021). Trusted digital repositories are particularly effective for long-term security and maintenance, as they meet criteria for preservation and management, ensuring accessibility and security over time despite technological changes (Marutha, 2021; Lin, 2022; Pharma, 2019).

Records accessibility

Records Access: As highlighted by Ngezana and Muchaonyerwa (2019), a primary objective of records management is to guarantee the security, easy accessibility and relevance of records for their required duration. Electronic records should be stored in a format that facilitates straightforward access, irrespective of

technological advancements. However, organizations need to ensure that access to sensitive, private or confidential information is restricted to personnel with the necessary rights (Bennett, 2019).

Records retrieval

Retrieval is a records management activity enabling users to search for records using keywords and additional details like dates and authors (Modiba *et al.*, 2023). The essence of records retrieval lies in accessing the appropriate records and ensuring they are accessible to the right individuals at the right time.

Record disposal

Marutha (2011) asserted that records disposal is the process through which an organization, under the guidance of its records manager, eliminates/erases ephemeral records or transfers archival-valued records to an archive institution for permanent safekeeping. Additionally, Section 13(2)(a) of the NARS Act stipulates that no public records under the control of any governmental body may be transferred to an archive's repository, destroyed, erased, or otherwise disposed of without a written disposal authority issued by the national archivist. This underscores that no record should be disposed of without the corresponding disposal authority (Ngoepe and van der Walt, 2010).

Records management activities that can be performed by artificial intelligence

AI has the capability to execute all records management activities—including record creation, automated classification, digitalization, storage, retrieval and disposal—more rapidly than humans (Modiba *et al.*, 2023; Modiba, 2021; Modiba, 2022). As highlighted by Modiba *et al.* (2019), archivists and records management professionals in South Africa can harness advanced technologies like AI to streamline and enhance the efficiency of their records management processes.

Records imaging is a records management activity that can be seamlessly executed through AI (Modiba *et al.*, 2023). Record scanning, commonly referred to as digitization, involves the conversion of paper files, microfilm rolls, microfiche and larger paper records into digital data for storage (Meshds, 2022). AI plays a pivotal role in records imaging, where robotic scanners and AI-powered software collaborate to create machines embedded with algorithms for efficient digitization (Ripcord Company, 2019). These AI-powered robotic machines not only remove staples from papers but also streamline the sorting and digitization processes, achieving faster results (Ripcord Company, 2019; Modiba, 2021).

Another records management activity adeptly handled by AI is classification. AI proves highly efficient in managing this laborious and time-consuming task. Leveraging machine learning algorithms, AI can analyze unorganized text, discerning its structure and content. Consequently, AI adeptly categorizes data according to predefined criteria, significantly enhancing the efficiency of searching and retrieving records (Woodward, 2018; Modiba, 2021; Ripcord Company, 2019).

Records storage is yet another records management activity effectively executed through AI. Following digitization and classification, AI-powered robots can seamlessly transfer records to cloud storage, ensuring secure and limitless storage capacity. As noted by Modiba *et al.* (2019), the cloud serves to address space constraints and offers precise access to records. An advantageous aspect of cloud centralized storage is its provision of a singular location for data storage, eliminating the need for duplicate or varied versions of the same information saved on multiple devices (Modiba *et al.*, 2023).

Retrieval, a crucial records management activity, empowers users to search for records using keywords, dates and authors (Modiba *et al.*, 2023). According to Ripcord Company (2019), AI-powered robots play a pivotal role in assisting records managers in swiftly locating and tracking records through keywords, Boolean searches and filtered searches. This capability ensures that AI enables the rapid and efficient retrieval of records. Moreover, AI and robotic machines facilitate the retrieval of records from cloud storage or a server using various devices such as laptops, desktop computers, cell phones and tablets (Modiba *et al.*, 2023).

The long-term preservation of records is an additional records management activity effectively executed by AI. Modiba *et al.* (2019) noted that the challenge faced by government organizations in managing records of enduring value. AI proves instrumental in preserving and retaining such records, using machine learning algorithms to recognize records that necessitate maintenance. This capability ensures timely notification to records management practitioners about the need for maintenance (Modiba *et al.*, 2023).

Security is another critical records management activity efficiently handled by AI. As highlighted by McHugh (2019), records management security encompasses safeguarding both paper and electronic information from physical damage, external data breaches and internal theft or fraud. When records are transferred to a cloud facility, AI ensures their protection through encrypted passwords and security codes, limiting access exclusively to authorized individuals. Yusuf and Adekoya (2021) emphasized the organizational responsibility to maintain secure and easily retrievable records, preserving the integrity of both paper and digital records.A robust and dependable cloud infrastructure, facilitated by AI, can effectively shield records from unauthorized access or tampering, restricting access solely to records management practitioners (Modiba *et al.*, 2023).

The disposal stage in the life cycle of records emphasizes the appropriate method of eliminating records based on their value, distinguishing between short-term and long-term significance (Marutha, 2011). Robotic machines, using deep and machine learning, accurately predict the expiration of digital records. Once records reach their expiration, they are systematically removed from both cloud and local systems, whereas those deemed valuable are archived. Subsequently, records are deleted from both the cloud and server, ensuring a streamlined and efficient disposal process (Modiba *et al.*, 2023).

Problem statement

The GDE faces a significant influx of records on a daily basis, but, akin to various government sectors in South Africa, it grapples with challenges in the effective and efficient management of its records (Mosweu and Rakemane, 2020; Maina, 2020; Ngoepe,

2012; Netshakhuma and Makhura, 2022). In essence, GDE currently experiences shortcomings in its records management practices. One notable challenge is the burden of overloaded shelves, leading to file loss and misfiling due to inadequate and improper storage of paper-based records (Nyamwanu, 2018; Schellnack-Kelly, 2013; Ngoepe and van der Walt, 2010). This predicament has resulted in a cumbersome and time-consuming process when attempting to retrieve records (Bakare *et al.*, 2016). Moreover, the GDE relies on Microsoft Access for electronic records management; however, this software's utility is restricted to locating files on physical shelves. When records are not systematically organized, retrieval becomes challenging. Compounding the issue, some of the GDE's digital records are stored on hard drives, introducing a greater risk as electronic records may degrade over time (Katuu, 2000).

Moreover, the GDE's records are currently not being maintained appropriately, posing a significant threat to their integrity. This issue is further compounded by the lack of proper temperature regulation in storage facilities (International Records Management Trust, 2006). Particularly for paper records, regular inspections, maintenance and control of temperature, humidity and lighting are essential to preserve their quality (IRMT, 2006). The records management activities at GDE must be enhanced to ensure effective and efficient management. AI presents a transformative solution to this challenge. AI-powered machines have the capability to digitize all paper-based records at the GDE, as emphasized by Modiba (2021). The digitization process offers numerous advantages, including easy accessibility to records and the elimination of space limitations (Tintswalo *et al.*, 2022). To ensure unlimited and proper storage, records can be securely stored in cloud storage integrated into robotic machines and the local server. Once the digitization process is complete, and all records are converted into a digital format, the GDE will have convenient access to its records. These digital records can be securely retrieved from databases using various devices such as laptops, desktop computers, tablets and cell phones (Ripcord Company, 2019; Modiba, 2021). Hence, a framework is proposed for records management practices that can be performed using AI and robotic machines. The framework will give the GDE clear guidelines on how AI can be used to perform its records management activities. This will assist the GDE in managing its records effectively with the help of AI and robotic machines.

Research methodology

Jansen and Warren (2020) defined research methodology as the approach or strategy used by a researcher to conduct a study. For this particular study, a mixed-method approach with a convergence design was used. A parallel sampling technique was chosen to simultaneously gather both qualitative and quantitative data (Creswell and Creswell, 2018; Kothari 2018). The study was approached from the perspectives of ontological pluralism and epistemic pragmatism (Ngulube, 2020). The study's population included six respondents, all employees of the GDE. Among the respondents, there was one records manager, four records manager assistants and one IT technician. Qualitative data was collected through interviews conducted with the records manager and the IT technician, whereas quantitative data was obtained from the four records manager assistants through questionnaires.

Purpose of the study

The purpose of the study is to investigate the adoption of AI to enhance records management practices at the GDE in South Africa. The following are the objectives:

- to assess the state of records management at GDE;
- to identify records management activities that can be managed through AI at GDE; and
- to propose a framework for the performance of records management activities at the GDE using AI.

Findings of the study

The current state of records management activities at Gauteng Department of Education

This study assessed the current state of records management at the GDE to explore the potential use of AI in its records management activities. Respondents were requested to indicate their agreement, uncertainty, or disagreement with statements regarding the current records management practices at the GDE. The findings are presented in Table 1. According to Table 1, all four respondents (100%) disagreed that records were in good condition. Regarding the storage of records, two respondents (50%) disagreed, one respondent (25%) agreed and one respondent (25%) was unsure. In terms of accessibility, one respondent (25%) agreed, two respondents (50%) disagreed and one respondent (25%) was unsure. Regarding the ease of retrieval, one respondent (25%) agreed and three respondents (75%) disagreed. Finally, one respondent (25%) agreed that records were well maintained, two respondents (50%) disagreed and one respondent (25%) was unsure.

Regarding the disposal of records, three respondents (75%) disagreed, one respondent (25%) was unsure and none agreed. However, all four respondents (100%) concurred that records were safe and adequately protected.

Records management activities that can be carried out by artificial intelligence

The study revealed that the application of AI has the potential to enhance records management services at the GDE.

Table 1 The rate of the current state of the GDE's records management ($n = 4$)

	Agreed	Disagreed	Unsure
The records are in good condition	0	4	0
Records are well-stored	1	2	1
Records are easily accessed	1	2	1
Records are easily retrieved	1	3	0
Records are maintained	1	2	1
Records are easily disposed	0	3	1
Records are safe and protected	0	4	0

Source: Developed by Modiba (2023)

Respondents were queried about the records management activities that could be effectively carried out using AI at the GDE. A majority of the respondents expressed agreement that AI can rapidly and accurately execute all records management activities. The questionnaire presented to the respondents encompassed a comprehensive list of activities associated with records management, prompting them to specify which activities they believed AI could effectively undertake. As depicted in Figure 1, three respondents (75%) affirmed that AI could perform all records management functions at GDE, spanning from creation to disposal, whereas one respondent (25%) was unsure.

Respondents were queried about their belief in the potential of AI to enhance records management functions, and specifically, which records management activities they perceived AI could improve. In the questionnaire, respondents were prompted to select activities that they considered could be enhanced by AI. Out of the respondents, three indicated that AI could improve all records management functions at GDE, spanning from creation to disposal. One respondent expressed uncertainty. The responses were as follows:

- Respondent 1 indicated "Yes, AI can improve creation, classification, retrieval, storage, maintenance and disposal."
- Respondent 2 indicated "Yes, AI can improve creation, classification, retrieval, storage, maintenance and disposal."
- Respondent 3 indicated "Yes, AI can improve creation, classification, retrieval, storage, maintenance and disposal."
- Respondent 4 stated "I am not sure."

During the interviews, participants were queried about their perspectives on whether AI could enhance records management functions and, if so, which specific records management functions they believed AI could improve. The responses were as follows:

Participant 1 stated "AI can improve all records management functions at GDE, I wish GDE could adopt AI it can even reduce things like backlogs and missing files." Participant 2 stated that "AI technology is the best, it can improve the way records are managed at GDE there is no doubt about that."

Discussion of the results

This section discusses the findings of the study based on the objectives.

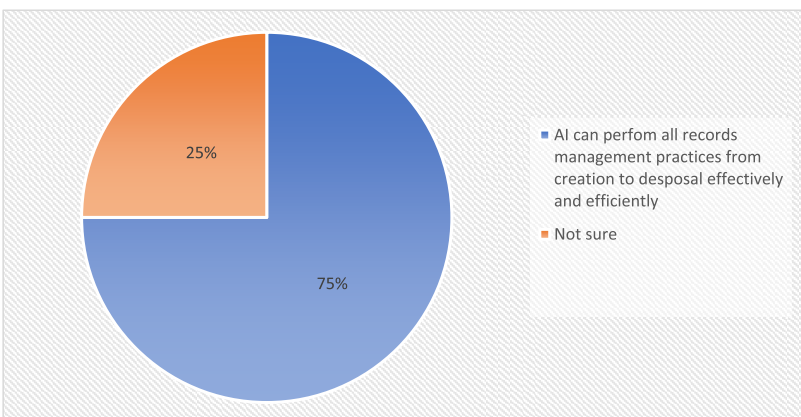
The current state of records management activities at the Gauteng Department of Education

As outlined by Ngoepe and Ngulube (2012), records management encompasses the process of overseeing records throughout their lifecycle, from creation to disposal. According to Mathope (2022), records play a crucial role as a tool for organizations to account for their activities. Kazi (2010) emphasized that ineffective management of records could result in insufficient support, leading to the loss of critical information and creating challenges for the organization.

All four respondents (100%) expressed that the records at GDE are in poor condition. Several challenges were identified, including insufficient storage space, a shortage of file cabinets, understaffing and an overwhelming workload. The results indicated that a majority of respondents gave low ratings to records management activities, with specific emphasis on the inadequate storage, limited access, challenging retrieval and subpar maintenance of records. One respondent (25%) agreed that records are easily accessible, mentioning that access requests were made through telephone, email or in person. However, two respondents (50%) disagreed that records are easily accessible.

One respondent (25%) concurred that records were easily retrieved; however, three respondents (75%) disagreed, attributing the difficulty to overloaded shelves that make searching for a file a daunting task. The majority of respondents (50%) disagreed that records were adequately maintained at the GDE. They explained that there are no temperature or pest controls in the storage area, posing risks such as potential damage from fire or floods. In contrast, all four respondents (100%) agreed that records were safe and protected. They noted that records are securely stored in a lockable room with restricted access. Despite the physical storage being safeguarded against unauthorized access, records remain

Figure 1 Records management activities that can be performed by AI ($n = 4$)



Source: Developed by Modiba *et al.* (2023)

vulnerable to natural hazards and other potential dangers that could harm them.

Three respondents (75%) disagreed that records were easily disposed of. The respondents provided additional details, explaining that instead of direct disposal, records that have completed their retention period are relocated to temporary storage at another facility. After two or three years, they are brought back, packed and transferred to the document warehouse. The final disposal of records occurs after a span of 20 years.

Records management activities that can be performed by artificial intelligence

The research carried out by Modiba *et al.* (2023) on the intersection of AI and records management unveiled the transformative capability of AI in handling various aspects of the records life cycle. AI proves instrumental in tasks ranging from record creation, digitization, classification, storage, maintenance, to retrieval. This paradigm-shifting revelation suggests that the integration of AI holds the potential to enhance the management of records for organizations, including the GDE, promoting efficiency and effectiveness (Modiba, 2021; Modiba *et al.*, 2023).

The study's results uncovered divergent perspectives on the potential influence of AI on records management functions. A significant majority of respondents (75%) affirmed that AI has the capacity to enhance all aspects of records management at the GDE, spanning from record creation to disposal. In contrast, a single respondent (25%) voiced hesitancy about the benefits of AI in GDE records management, citing concerns that if AI assumes responsibility for all tasks, it might result in job losses.

The participants were unanimous in their belief that AI has the capacity to effectively perform all records management activities at the GDE. Notably, during interviews, the records manager, exuding confidence in AI's capabilities, emphasized its potential in tasks such as reducing backlogs and preventing missing files. Expressing a strong desire for the GDE to adopt AI, the records manager believed it could significantly improve records management processes. Another participant echoed these sentiments, asserting that AI is the optimal system with undeniable potential to enhance records management activities at the GDE. Overall, the participants shared a consensus that AI could be a transformative force, revolutionizing records management practices at the GDE.

Recommendation, proposed framework and conclusion

Recommendations

This study introduces a comprehensive framework designed to serve as a guiding tool for the GDE in the integration and use of AI and robotic machines. The primary goal of this framework is to provide a structured approach for delivering superior records management services, effectively addressing the existing challenges within the GDE's current records management system. AI and robotic machines are identified as pivotal elements in the framework, contributing significantly to tasks such as digitizing and classifying records, securely transferring them to cloud storage and enabling secure access and prompt retrieval of records as needed.

Recommended framework

This section introduces the framework for incorporating AI into records management activities at the GDE. The outlined framework is designed to achieve a seamless integration between AI and records management, empowering the GDE to proficiently handle records with the aid of advanced robotic machines. Figure 2 illustrates the recommended framework.

The recommended framework for records management activities at the GDE commences with the creation of records, emphasizing the generation of electronic formats. Subsequently, paper-based records from the GDE, reaching their disposal date, undergo transfer to the document warehouse prior to the digitization process. Automation is introduced through a robotic machine equipped with an embedded automated classification algorithm, facilitating the conversion of active paper records into digital format. The autoclassification algorithm ensures the grouping of records by subject, using the black box algorithm within the robotic machine.

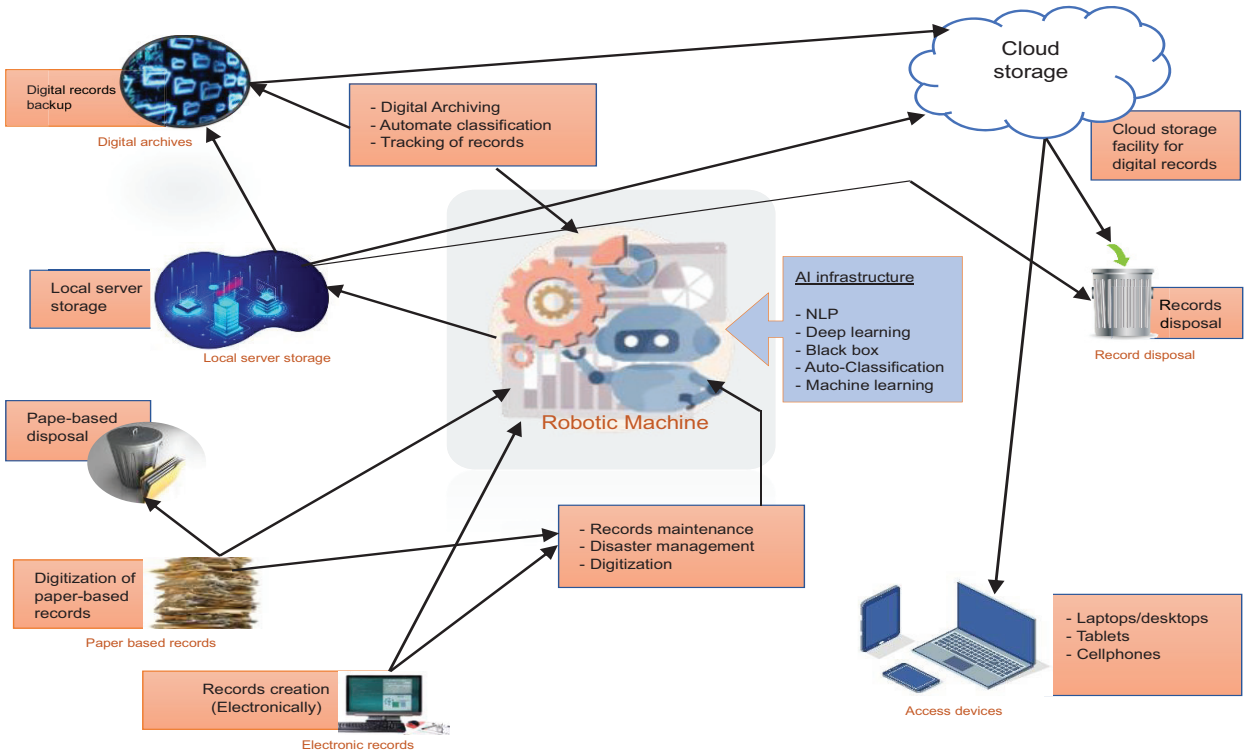
Born-digital records within the GDE are subjected to meticulous maintenance to guarantee error-free status. The robotic machine, incorporating machine learning algorithms, then transfers these records to designated storage facilities, including servers and cloud storage. The machine tracks the movement of records throughout the digitization and transfer stages until the records retrieval phase. To ensure secure access, records are safeguarded with encrypted passwords and security codes, restricting authorization to designated individuals.

For efficient retrieval, records management practitioners can use computer technology, using diverse search strategies such as subject, persal numbers, Boolean Logic and more, enabling easy accessibility whenever required. Furthermore, through advanced deep learning algorithms and machine learning algorithms, the robotic machines possess the capability to discern the expiration of digital records' lifespan. The disposal process occurs seamlessly through the integration of machine learning and neural network algorithms within the robotic machine, leading to the automatic deletion of digital records from both cloud storage and servers once the disposal period is reached. This comprehensive framework ensures a streamlined, secure and efficient records management process at the GDE.

Conclusion

AI and robotic machines stand as powerful tools with the capacity to significantly elevate all facets of records management, spanning from the inception of records to their ultimate disposal. In particular, AI demonstrates its effectiveness in handling time-consuming and laborious tasks such as the classification and sorting of records. Through extensive research, it becomes evident that AI presents a transformative solution to the prevailing challenges within records management. The capabilities of AI extend beyond mere process streamlining; they serve as a robust means to

Figure 2 Framework to adopt artificial intelligence to enhance records management practice



Source: Developed by Modiba (2023)

address identified challenges comprehensively. AI not only minimizes risks but also optimizes storage resources, unlocking the latent potential of organizational records for improved outcomes. Implementing AI and robotic machines within the GDE emerges as a pragmatic approach to tackle the current predicament of inadequate space for proper record storage, offering a scalable and unlimited capacity. Cloud storage, as a key component of this integration, emerges as a vital solution to challenges such as misfiling and record loss. This strategic move not only ensures secure and organized storage but also facilitates seamless retrieval when needed. Furthermore, the adoption of AI and robotic machines presents a promising solution to the challenge of a limited workforce grappling with an ever-expanding workload. In essence, the use of AI within the GDE is poised to revolutionize records management, offering efficiency, precision and scalability. By leveraging AI's capabilities, the GDE can effectively and efficiently manage its records, overcoming current challenges and positioning itself for enhanced productivity and strategic decision-making.

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