ESARBICA JOURNAL

JOURNAL OF THE EASTERN

AND SOUTHERN AFRICA

REGIONAL BRANCH OF THE

INTERNATIONAL COUNCIL ON

ARCHIVES

Volume 43
2024

ISSN 2220-6442 (Print), ISSN 2220-6450 (Online)

https://dx.doi.org/10.4314/esarjo.v43i1.7

Artificial intelligence to support public digital archiving in South Africa

Mashilo Thomas Modiba
University of South Africa
modibmt@unisa.ac.za
0000-0003-2843-0056

Ngoako Solomon Marutha
University of South Africa
emarutns@unisa.ac.za
0000-0002-5679-4394

Received: 05 August 2024
Revised: 01 October 2024
Accepted: 09 December 2024

Abstract

The use of artificial intelligence in digital archives has the potential to support public archives in the provision of quality archival services in the fifth industrial revolution. Digital archives can be made more effective in providing quality services and become more accessible through artificial intelligence and intelligent robotic machines in the fifth industrial revolution. This study sought to explore the use of artificial intelligence to support public digital archiving in South Africa. Public archives preserve crucial records of communities for ease of access. There is a need to incorporate the use of artificial intelligence and intelligent robotic machines to support the preservation of, and access to, records in the public archives of South Africa. The study was based on a literature review and the experience of the researchers in respect of the application of artificial intelligence for records and archival management in South Africa. Artificial intelligence can be used to support the digital archives in ensuring that digital archives are safe, protected and accessible. A framework on the application of artificial intelligence was also recommended to assist with the utilisation of artificial intelligence for the management of public digital archives in the fifth industrial revolution.

Keywords: artificial intelligence, robotic machine, public archives, digital archives, fifth industrial revolution

Introduction

The use of artificial intelligence (AI) in digital archives has the potential to support public archives in the provision of quality archival services in the fifth industrial revolution (5IR). In the 5IR, archival institutions around the world utilise new technologies, such as AI, intelligent robotic machines, the internet of things (IoT), big data, cloud computing and blockchain technology, to provide effective archival services in public archives (Bakogiannis, Mytiliuis, Doka and Goumas, 2020; Modiba, 2021). In the 5IR, archival institutions across the world utilise disruptive technologies, such as AI, intelligent robotic machines, cobots, IoT, big data technology, cloud computing technology and blockchain technology, to provide effective archival services in public digital archives (Nel-Saunders, 2023). Fifth industrial revolution

(5IR) refers to the collaboration between Artificial Intelligence (AI) and Human Intelligence (HI) where the strength of AI together with the strength of HI collaborate to perform the digital archiving activities adequately. Cobots will then be used in the 5IR to perform the digital archiving activities, however they are not yet applied. Cobot is a collaborative robot - human intelligence that can be used to discharge certain activities such as digital archiving (George and George, 2023). In digital archives archival materials are digitized to be stored, captured, organized, arranged and pluralized for permanent access to authorized people.

Digital archives are usually created with the goal of preserving historical objects and making them available to researchers and the general public. Digital archives are similar in purpose to physical archives, but the historical documents and objects that provide evidence of the past have been digitised (often by scanning or photography, unless a document was created digitally in the first place) and made available online (Szekely 2017; Manesh, Pellegrini, Marzi and Dabic, 2020; Chung, 2021). In the 5IR, AI and intelligent robotic machines can be used to ensure that digital archives are managed effectively, and public archives are made available to the public through the use of computer technology. Digital transformation will assist in turning ancient archives into digital archives**.** Consequently, automation in the form of AI is increasingly applied both to scale traditional record-keeping activities and to experiment with novel ways to capture, organise and access records (Colavizza, Blanke, Jeurgens and Noodeegraaf, 2021). Hence, this study investigates how AI can be used to support digital public archives to ensure that effective archival services are provided in the 5IR.

Background

Digital archives can be made more effective in providing quality services and become more accessible through AI and intelligent robotic machines in the 5IR. 5IR is a way of describing the blurring of boundaries between the physical, digital and biological worlds. It is a fusion of advances in AI, robotics, the IoT, three-dimensional (3D) printing, genetic engineering, quantum computing and other technologies (Modiba, 2021). Müller and Nick (2016) and EE Publishers (2017) define AI as elements of various technologies that can be joined in various ways to understand, comprehend, act and learn (this refers to big data joined with cloud connectivity and the IoT). Iron Mountain (2019b) refers to AI as the process of working with intelligent robotic and cobotic machines to do jobs better, to produce greater competences and to drive economic evolution.

In the context of this, AI refers to programmed and intelligent robotic machines and AI-powered computer programs that are capable of automatically carrying out a difficult sequence of activities in the area of archives and records management (Iron Mountain, 2019a; Modiba, Ngoepe and Ngulube, 2019). The adoption of a framework for the utilisation of AI for records management is central to investigating how AI-embedded digital archives can support digital public archives. Hence, this study proposes a framework to showcase how AI can support digital public archives in the 5IR.

Context to public archives

Public archives refer to all public records that have ceased to be in current use in the organisations in which they were originally created or received or in the organisations in whose custody they have been stored or that have been deposited in the national archives of a country (Venson, Ngoepe and Ngulube, 2014). Public archives further refer to all public records deemed by the Director-General of an any organisation to be of permanent value or to have inherent value. They also refer to public records, manuscripts, documents or other printed

matter that is more than 30 years old and is kept or deposited at the archives for permanent preservation (Garaba, 2015a). Public archives are records appraised and nominated by organisational archivists as archival records for preservation in the organisational records office, which is the central organisational archives, or any place of deposit appointed by the organisational archivists. National archives play a crucial role in the national development of a country through the management and preservation of public archives, which may include the utilisation of archives for the advancement of historical accountancy, justice, democracy and good governance, human rights and the settlement of disputes among countries (Venson, Ngoepe and Ngulube, 2014). The utilisation of AI and intelligent robotic machines will help ensure that archives are managed effectively and efficiently so that communities will have access to archives, regardless of the place and the time (Colavizza et al., 2021).

Context to Artificial Intelligence

Artificial intelligence (AI) is a branch of computer science. It involves developing computer programs that can perform tasks that would otherwise demand human intelligence (HI) International Bar Association (IBA) Global Employment Institute, 2017). AI algorithms can address learning, perception, problem-solving, language understanding and/or logical reasoning. AI became widespread across the globe in the era of the 5IR (Manesh et al. 2020). 5IR refers to a world where people move between digital spheres and electronic reality with the aid of connected technology, such as blockchain technology, AI, cobots, robots, big data and the IoT, to manage their activities in daily life (Xu, David and Kim, 2018**).** AI is illustrated by robotic machines, unlike the HI demonstrated by humans and animals, which includes consciousness and emotionality. AI relates to computer systems that are able to perform tasks that are considered to require HI, that is, cognitive tasks. AI also refers to machine learning, natural learning processing (NLP), black box and deep learning that can be utilised to perform different kinds of activities better and faster than HI (Atzori, Lera and Morabito 2010). In the 21st century, AI techniques have experienced a resurgence following simultaneous advances in computer power, large amounts of data and theoretical understanding. Furthermore, AI techniques have been a vital part of the technology industry, helping to solve many challenging problems in computer science, software engineering and information science (Manesh et al., 2020). AI and intelligent robotic machines are steadily creeping into diverse parts of records, archives and information management throughout the world. Archives are becoming big data organisations and, like all big data organisations, have to put their trust at least partly into AI, mostly in the form of machine learning, to deal with this transformation. Archives the world over are acquiring AI capacities to organise their workflows around the big data they have and to offer their big data to outside organisations (Colavizza et al., 2021).

Artificial Intelligence to support public digital archiving

Artificial intelligence (AI) has the potential to support the future of public digital archiving in the 5IR. The use of AI will ensure that public archives are effectively and efficiently stored in cloud storage facilities and that access to public records is effortless (Spilker and Reutter, 2019; Modiba 2021). Once records have been digitised/transferred and classified through automated classification algorithms, they will be stored in cloud storage facilities and local server storage facilities. Organisations should ensure that when digital records are stored in cloud storage facilities and on local servers, the records are secure (Fernandez-Aleman, Senor, Lozoya and Toval, 2013). Records should be protected through encrypted passwords and security codes to ensure that only authorised people have access to them (Spilker and Reutter, 2019). Through deep learning algorithms and machine-learning algorithms, robotic machines are able to detect when the lifespan of digital records expires (Iron Mountain, 2019b). Digital records should be

deleted automatically from cloud storage facilities and servers (Gill, 2019; Iron Mountain, 2019a; Modiba, 2021). The disposal process should take place continuously via machine-learning algorithms and neural network algorithms of the intelligent robotic machines once the disposal period is reached (Harpur, 2013).

Digital records should only be accessed and retrieved technologically at organisations through the Natural language processing (NLP) algorithms embedded in robotic machines (Demaitre, 2020). The public should be able to retrieve digital records that are stored in cloud storage facilities, local servers and digital archives, depending on where the records are located at a given point in time. The public should further be able to use computer technology, such as laptops, desktop computers, tablets and smartphones, to retrieve digital records (Gill, 2019; Modiba, 2021). If the public can access public records effortlessly, digital archives will have a bright future (Ilachiniski, 2017). Public archives that are easy to access will promote awareness about public archives in communities (Mojapelo, Modiba and Saurombe, 2021). Therefore, it is important that public archives utilise AI and intelligent robotic machines to support public digital archiving in the 5IR.

Problem statement

Many public archives are manually managed; some records are scanned and saved in an electronic records management system. Though digitised records give the public access to public archives, the digitisation process takes time. Hence, the public has limited access to public records. Consequently, members of the public hesitate to visit and utilise public archives, causing public archives to become dormant. Little is known about public archives, especially in rural communities.

The adoption and utilisation of AI in public archives will ensure their effective digitisation to ensure that majority or all citizens are able to access archival materials digitally through online network using their smartphones and computers. Intelligent robotic machines and AI-empowered software applications will ensure that records are robotically digitised and stored in cloud storage facilities and digital archives (EE Publishers, 2017; Ilachiniski, 2017). Computer technology embedded in AI and robotics will also enable smooth and quick access to records in public archives, regardless of the location (IBA Global Employment Institute, 2017; Modiba, 2021). Only internet connectivity and smart technology will be required to access public archives. This study intends to investigate how AI can support public digital archiving in the 5IR.

Purpose and objectives of the study

The purpose of the study is to investigate the use of artificial intelligence to support public digital archiving in the 5IR. The objectives of the study are to:

- establish the use of artificial intelligence to support public digital archiving in the 5IR in South Africa.
- propose a framework for the use of artificial intelligence to support public digital archiving in the 5IR in South Africa.

Research methodology

This qualitative study is based on a literature review and the experience of the researchers in respect of the utilisation of AI for the management of records and archives in South Africa.

The literature was navigated through the use of themes and keywords. The keywords used include “fifth industrial revolution”, “AI”, “digital records” and “public archives”. Boolean login operator was applied to include more than one keyworks in the search, such as artificial intelligence and digital archiving, or public archive and South Africa. This was helping in limiting or narrowing the search results and at the end the search engine provided mostly relevant information sources. The main search engine utilised was Google Scholar since it linked the researchers to various websites and databases that hosted or held information about required sources that was relevant to the study. At times, thousands of literature sources were listed, and the researchers were able to browse and open the relevant literature from the Google outputs summary. Some of the literatures were linked to websites and others to journal and e-books databases. Clicking the link led researchers to the original sources of the literature in respective databases and websites. Relevant literature were reviewed and analysed in addressing objectives of the study.

Results of the study

The literature review in this study is based on how AI can be used to support public digital archiving in the 5IR. The literature review on digital archives is reflected in Figure 1.

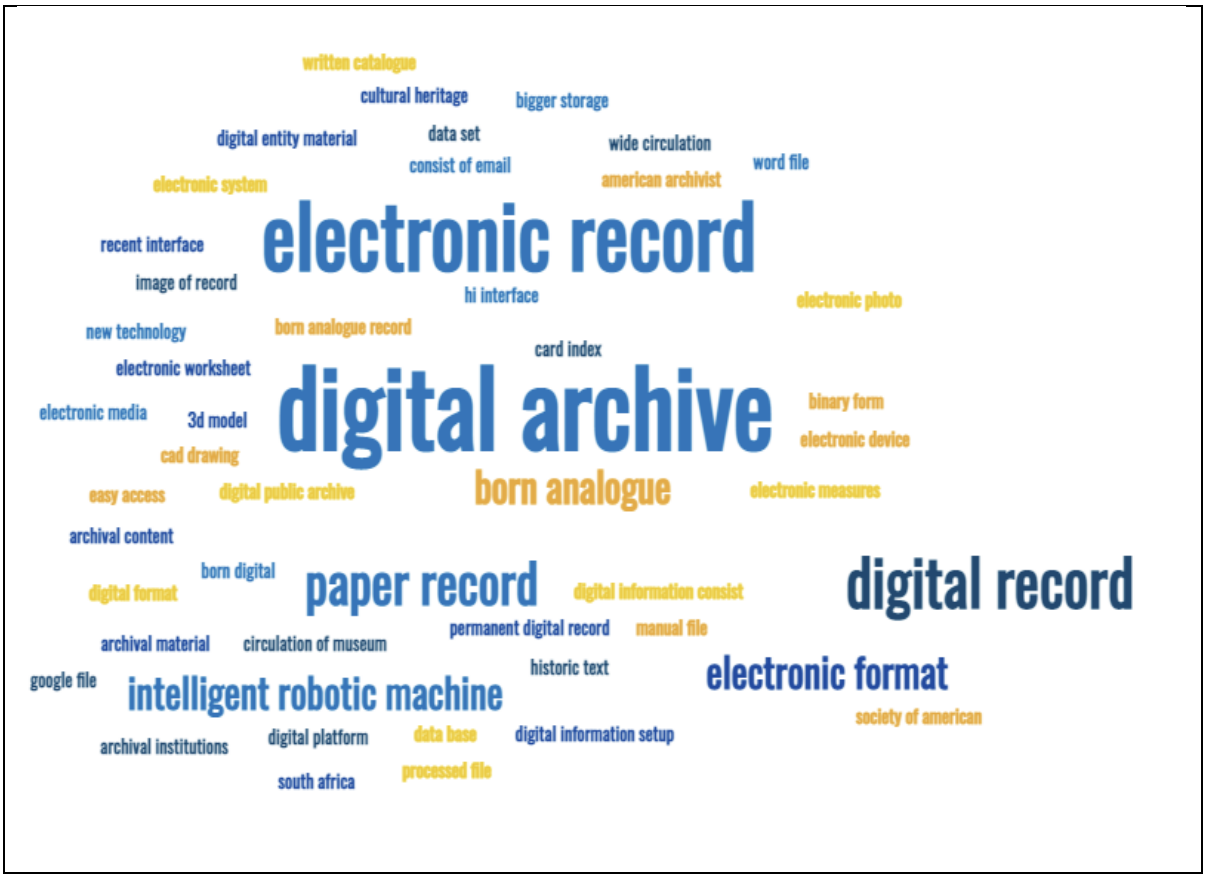

Figure 1: Conceptual framework for digital archives in the 5IR

Digital archives are digital records that are stored in digital platforms for easy access and bigger storage. Digital records are any records that are digitised by means of scanners so that they can be stored in digital archives (Szekely, 2017). According to Müller (2021), digital archives showcase cultural heritage like photographs, objects, artefacts or historic texts, encoded in binary form, while written catalogues and card indices are recent interfaces that determine the HI interface of digital archives. Digital archives that are accessible worldwide through the

internet have the potential of a wide circulation of museum and archival content, and of increasing range and relevance (Müller, 2021). Digital archives display the digital hubs and consequently constitute a digital contact network, shifting the balance of power away from museums to the communities from which the objects originate. Unlike paper-based records, born-digital records are records created in an electronic format (rather than having been digitised from paper records) (Ringel, 2017). Examples of born-digital information are emails, manual files (Word files and Google files), presentations (PowerPoint), worksheets (Excel), PDF files, pictures, videos, CAD drawings, 3D models, and data sets and databases. A born-analogue record refers to information that were created in an analogue form like video cassettes (Garaba, 2015b).

An electronic record is a file stored in electronic media that can be accessed electronically (Read and Ginn 2015; Franks 2018). An electronic record consists of data that is captured by a computer and received in the initiation and accomplishment of institutions or persons' functionalities (Cunningham and Montana, 2006). Examples of electronic records are emails, word-processed files, electronic worksheets, electronic photographs and databases. An electronic record also relates to information typed by electronic means and that may or may not have a paper record to support it (Penn, Pennix and Coulson, 2016). Electronic records integrate both analogue and digital information formats, although the perception mainly means that information is deposited in electronic systems (Asogwa, 2012). Electronic records generally refer to records created in electronic format (born digital) but the term 'electronic records' is often used to refer to images of records in other formats (reborn digital or born analogue) (Franks, 2018), that is, records that were created in a non-digital format and subsequently digitised (Ji, 2018).

The Society of American Archivists distinguishes between 'electronic records' and 'digital archives' as follows: "Electronic records are those, whether digital or analogue, that need electronic devices such as scanners and a database in order to be created and used; while 'digital archives' refers to permanent digital records that need a computer to create and use them (Ringel, 2017)." Just as the term 'archives' can be interpreted to mean both archival materials and the repositories that house them, the word 'digital archives may refer to an archival institution that manages electronic records or a collection of digital materials. In some organisations, records that have an enduring value are transferred to digital archives as backups (Duranti & Rogers, 2019). Digital records that have an enduring value should be automatically transferred to digital archives for archiving purposes through intelligent robotic machines (Modiba, 2021). In the 5IR, the staff of digital archives are often part of a young, IT-savvy generation that can play an important role in the adoption of new technologies such as AI and intelligent robotic machines to support digital public archives (Müller, 2021). This study investigates the utilisation of AI in ensuring that digital public archives provide reliable archival services in the 5IR.

Digital archiving is the process of converting, organising, preserving and storing a record in hard-copy format into a digital form. There are many benefits attached to digital archives. Firstly, in digital archiving there is no chance of losing data. By contrast, it is easy to lose data when it is in a physical form – an important file may get misplaced if it is not kept safe, especially when there is a lot of paperwork in one's care. Retrieving information out of several files and folders can be difficult and time-consuming (Asogwa and Ezema, 2012). However, with digital archives, it is easy to retrieve files – everything is available within a few clicks – and once data has been sorted, files are clustered in proper folders. The likelihood of losing data is smaller when files are stored digitally. It is also easy to search for records in digital archives, and access to digital archives is unlimited (Yadav, 2016).

Another benefit is that digital archiving is eco-friendly. The use of paper and stationery is regarded as a waste of money and resources as far as managing archives is concerned (Keneley, Potter, West, Cobbin and Chang, 2016). The use of paper files is also considered environmentally unfriendly; hence, organisations are moving towards digital archives (Asogwa and Ezema, 2012).

Furthermore, digital archiving provides complete data security. Paper-based records are always at risk of being shared with the wrong people, which can easily breach the confidential side of information (Keneley, et al. 2016). Documents that are not locked and kept out of reach of people can be accessed by anyone, posing a threat in many ways, especially if the information is important (Asogwa and Ezema, 2012). However, digital archives can safeguard personal and confidential files, and access can be granted to limited people. Digital archives can be safeguarded with encrypted passwords and other security measures.

Digital archiving also provides faster access to data. It is not easy to access paper-based files, especially when they are not properly managed. The users of such files end up spending hours searching for records on shelves or in cabinets. Digital files are always easy to retrieve (Asogwa, 2011) – they are available to the users in just a few clicks since they are stored in a cloud, and accessing a cloud is effortless, especially when one has proper connectivity (Yadav, 2016).

Furthermore, digital archives are simpler to manage than paper-based files. Paper-based files can be damaged, lost and misplaced. They must be stored in the best condition to ensure they do not fade away or crack (Asogwa, 2011). There are a lot of dynamics involved in managing paper-based files, such as dealing with papers of different sizes that have to be trimmed so that they can be filed together. However, in the case of digital archives, one only has to scan documents and save them in the right folders, making them easy to manage (Yadav, 2016).

A significant benefit of digital archiving is that it can cut down on costs. Organisations save inventory and stationery costs when records are not managed manually. In digital archives process, less costs will be incurred since only resources to digitise are needed (Asogwa and Ezema, 2012). Digital archives are also ideal for organisations with multiple branches because they will not have to invest in transporting and sending files to different branches. Digital archives simplify the file-storage process, and the off-site storage of files saves valuable time for organisations (Keneley et al., 2016).

Lastly, digital archiving may offer a second chance to retrieve files. It is easy to lose paper-based records and to never have access to them again, especially if they are not backed up. Digital archives give users multiple opportunities to retrieve records. Even if a file is deleted, it will be stored in the recycle bin for some days before it is permanently deleted (Asogwa, 2011; Yadav, 2016). In the digital archives same archival materials may be shared among different clients and different regions in both national and local areas.

Discussion of the findings

It is clear that digital archiving is the only way to go in the current era of technological disruption. Digital archives offer a lot of advantages compared to the traditional formats of archival materials. Globally, archival institutions have been considering digitising their archival materials for many years but have not made significant progress in this regard. This may be because the kinds of technology used in past decades were not easy to adopt owing to different reasons, including cost and infrastructure challenges. Some of the hiccups or barriers experienced in the past have been removed by the introduction of AI. For instance, in the past,

safety and security measures for records that were kept electronically were very slim. To give a typical example, one could keep or store records in a system one day, only to discover the next day that the records were no longer accessible or available where they had been stored, or that the information has ended up in the public domain such as on social media, in the press, over the radio and on television. It was daunting to adopt electronic systems for record-keeping, although they offered many advantages. With the introduction of AI, the use of electronic systems for digital archiving started to become more widely accepted. Electronic systems that use AI may help ensure smooth access to information by authorised people, if they are properly planned and implemented. Such systems may help to eradicate many challenges in archives and records management, thus giving organisations greater peace of mind. Systems that make use of AI offer more advantages to organisations than ordinary systems in that they can ensure that technology can do almost anything on behalf of humans without wasting time and energy on the activities in the processes of discharging the digital archives services**.**

Suggested framework

It is recommended that organisations adopt AI to bring about improvements in their work processes. With the use of AI, organisations may achieve more than expected in terms of production and/or services and customer satisfaction. They may see great improvements in production as far as both quality and quantity are concerned as compared to manual methods and ordinary systems. In the case of digital archiving, AI may be able to perform many activities, as illustrated in Figure 2. Figure 2 shows that artificially intelligent technology may assist with digitisation activities or functions, as well as with the creation and capturing of born-digital archives. Organisations should implement AI, observing the legislative framework governing archives and records management and digitisation. The figure illustrates that using AI for archives and records management activities, including digital archiving, may yield many positive results or benefits, including improved records safety and security, eco-friendly processes, easy access to records, simpler management of records, multiple retrieval of records by many users and cost savings.

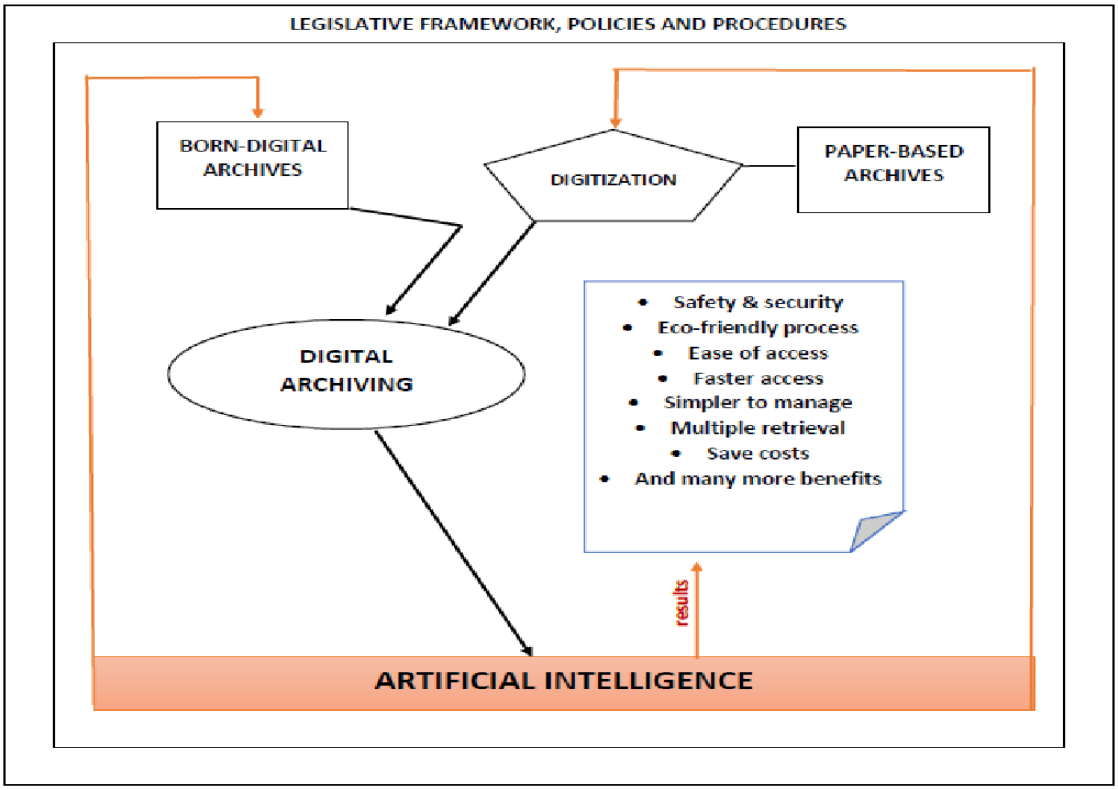

Figure 2: Framework for the use of artificial intelligence to support public digital archiving in fifth industrial revolution

Conclusion

It is hoped that the proposed framework will promote the implementation of AI for the digitisation of archival materials in view of the benefits that the use of AI offers. If organisations adopt AI for digital archiving, there will no longer be situations where archival records are missing when users request them. Organisations will no longer keep their clients waiting before providing them with the information they require. Records management activities will no longer pose a challenge since an electronic system will be doing almost every activity, especially tiring and difficult activities. Organisations will be able to sit back while an electronic system discharges all the functions for them. They will be able to provide many clients with the same digital records at the same time at different locations or areas. An electronic system will also enable clients who work together on a project to discuss information in the same records, even if they are located in different geographical areas. Such a system may save both clients and archival organisations time and money in respect of travelling expenses and the cost of managing archival materials. It may be concluded that AI is the way to go in any sphere of information management, including archiving. It is hoped that this holistic framework, if properly customised by archival institutions universally, will yield positive results with respect to production and customer satisfaction since businesses in all industries focus on satisfying their clients.

References

Asogwa, B.E. 2012. The challenge of managing electronic records in developing countries: implications for records managers in sub-Saharan Africa. *Records Management*

Journal, 22(3):198-211.
Asogwa, B.E. 2011. Digitisation of archival collections in Africa for scholarly communication: strategies and challenges. *Library Philosophy and Practice*, 651:1-14.
Asogwa, B.E. and Ezema, J.I. 2012. The challenges of preservation of archives and records in the electronic age. *PNLA Quarterly*, 76(3):1-11.
Atzori, L., Lera, A. and Morabito, G. 2010. The internet of things: a survey. *Computer Networks*, 54(15):2787-2805.
Bakogiannis, T., Mytiliuis, L., Doka, K. and Goumas, G. 2020. Leveraging blockchain technology to break the cloud computing market monopoly. *Computer*, 9(1):1-9.
Colavizza, G., Blanke, T., Jeurgens, C. and Noordegraaf, J. 2021. Archives and AI: an overview of current debates future perspectives. *Journal on Computing and Cultural Heritage*, 15(1):1-15.
Chung, H. 2021. Adoption and development of the fourth industrial revolution technology: features and determinants. *Sustainability*, 13(871):1-16.
Cunningham, G.C. and Montana, J.C. 2006. *The lawyer's guide to records management and retention*. Chicago: The Law Practice Management Section.
Demaitre, E. 2020. *Ripcord uses robotics to digitize records, processes and avoid paper waste*. [Online]. Available WWW: https://www.therobotreport.com/ripcord-robotics-digitizes-records-aids-recycling/ (Accessed 31 July 2021).
Duranti, L., Eastwood, T. and MacNei, H. 2002. *Preservation of the integrity of electronic records*. Dordrecht: Kluwer Academic.
Duranti, L. and Rogers, C. 2019. *Trusting records and data in the cloud: the creation, management and preservation of trustworthy digital content*. London: Facet Publishing.
EE Publishers. 2017. *Artificial intelligence: is South Africa ready?* [Online]. Available WWW: https://www.ee.co.za/article/artificial-intelligence-south-africa-ready.html (Accessed 9 July 2021).
Fernandez-Aleman, J.L., Senor, I.C., Lozoya, PAO. and Toval, A. 2013. Security and privacy in electronic health records: a systematic literature review. *Journal of Biomedical Informatics*, 46:541-562.
Franks, R.F. 2018. *Records and information management*. 2nd ed. New York: University of North Texas.
Garaba, F. 2015a. Disembodied archives: the disconnectedness of records and archives management practices within the Pietermaritzburg Cluster of Theological Libraries, KwaZulu-Natal, South Africa. *Verbum et Ecclesia*, 36(1):1-20.
Garaba, F. 2015b. Dodos in the archives: rebranding the archival profession to meet the challenges of the twenty-first century within ESARBICA. *Archives and Records: Journal of the Archives and Records Association*, 36(2):216-225.
George, A.S. and George, A.S.H. 2020. Industrial Revolution 5.0: *The Transformation of the Modern Manufacturing Process to Enable Man and Machine to Work Hand in Hand, Seybold Report*, 15(9), 214- 234.
Gill, A. 2019. Artificial intelligence and international security: the long view. *Ethics and International Affairs*, 33(2):169-179. doi: 10.1017/S0892679419000145
Harpur, P.A. 2013. *Evaluation of usability and user experience of an m-learning environment, custom-designed for a tertiary educational context.* Master's thesis. Pretoria: University of South Africa.
IBA Global Employment Institute. 2017. *Artificial intelligence and robotics and their impact on the workplace*. [Online]. Available WWW:

https://scholar.google.co.za/scholar?q=Artificial+intelligence+and+robotics+and+their+impact+on+the+%09workplace&hl=en&as_sdt=0&as_vis=1&oi=scholart (Accessed: 21 July 2022).

Ilachiniski, A. 2017. *Will artificial intelligence change the world for the better? Or worse ? Read our new policy paper*. [Online]. Available WWW: https://www.internetsociety.org/blog/ 2017/04/will-artificial- intelligence-change-the-world-for-the-better-or-worse-read-our-new-policy -paper/ (Accessed: 30 July 2022).

Iron Mountain. 2019a. *What artificial intelligence could mean for records managers.* [Online]. Available WWW: https://www.ironmountain.com/resources/general-articles/w/what-artificial-intelligence-could- mean-for-records-managers (Accessed: 13 August 2022).

Iron Mountain. 2019b. *Artificial intelligence and records management.* [Online]. Available WWW: https://www.ironmtn.com.au/resources/general-articles/a/artificial-intelligence-and-records- management (Accessed: 13 August 2022).

Ji, M. 2018. Major issues in adoption of electronic health records. *Journal of Digital Information Management*, 16(4):180-191.

Keneley, M., Potter, B., West, B., Cobbin, P. and Chang, S. 2016. Digitizing archival records: benefits and challenges for a large professional accounting association. *Archivaria*, 81:75-100.

Manesh, M.F., Pellegrini, M.M., Marzi, G. and Dabic, M. 2020. Knowledge in the fourth industrial revolution: mapping the literature and scoping future avenues. *IEEE Transactions on Engineering Management*, 68(1):1-7.

Modiba, M. T. 2021. *Utilising artificial intelligence technology for the management of records at the Council for Scientific and Industrial Research in South Africa.* PhD thesis. Pretoria: University of South Africa.

Modiba, T, Ngoepe, M. and Ngulube, P. 2019. Application of disruptive technologies to the management and preservation of records. *Mousaion*, 37(1):1-14.

Mojapelo, M., Modiba, M. and Saurombe, N. 2021. *Applying Batho Pele principles in South African public archives – do public programming initiatives count?* [Online]. Available WWW: https://doi.org/10.1177/02666669211049382 [Accessed: 20 July 2022].

Müller, V.C. and Nick, B**.** 2016. Future progress in artificial intelligence: a survey of expert opinion. Fundamental issues of artificial intelligence. *Synthese Library Studies in Epistemology, Logic, Methodology, and Philosophy of Science*, 376:553-571.

Müller, K. 2021. *Digital archives and collections: creating online access to cultural heritage.* New York: Berghahn Books.

Nel-Saunders, D. 2023. Revolutionizing Public Private Partnerships: A transition to the Fifth Industrial Revolution. *School of Public Management, Governance and Public Policy.* South Africa.

Penn, A., Pennix, G.B. and Coulson, J. 2016. *Records management handbook.* New York: Routledge, Taylor & Francis Group.

Ringel, S. 2017. Digitizing the paper of record: archiving digital newspapers at the New York Times. *Journalism*, 00(0):1-17.

Szekely, I. 2017. Do archives have a future in the digital age. *Journal of Contemporary Archival Studies*, 4(1):1-16.

Spilker, H.S. and Reutter, L. 2019. The quest for workable data: building machine algorithms from public sector archives (pp. 96-107). In A. Sudmann. *The democratization of artificial intelligence: net politics in the era of learning algorithms* (pp. 1-335).

Verlag: Bielefeld.
Read, R. and Ginn, ML. 2015. Records management. Cengage Learning, 10th ed.
Venson, S.L., Ngoepe, M. and Ngulube, P. 2014. The role of public archives in national development in selected countries in the East and Southern Africa Regional Branch of the International Council on Archives region. *Innovation: ESARBICA Journal*, 48:43-64.
Xu, M., David, J.M. and Kim, J.H. 2018. The fourth industrial revolution: opportunities and challenges. *International Journal of Financial Research*, 9(2):90-95.
Yadav, D. 2016. Opportunities and challenges in creating digital archive and preservation: an overview. *International Journal of Digital Library Services,* 6(2):63-73.