Artificial intelligence for the improvement of records management activities at the Council for Scientific and Industrial Research

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Abstract

This study sought to investigate the usability of artificial intelligence (AI) for the improvement of records management activities at the Council for Scientific and Industrial Research (CSIR) in South Africa. Usability of AI and intelligent robotic machines for the management of records plays a crucial role in ensuring that records management activities are improved and managed effectively and efficiently. However, usability issues are critical in many AI systems, where human intelligence (HI) works with the system to work out and apply results (as with speech system). The convergent mixed methods research approach was applied and data were collected using interviews and questionnaires techniques. A questionnaire was administered to three professional repositories and indexers, two archives' technicians and one data librarian. Interviews were conducted with one portfolio manager and one records manager. Data were analysed thematically and statistically and presented using tables and figures. AI has the capability to replace records practitioners since it can perform activities performed by records practitioners. This transition can have a negative impact on the usability of AI to improve the records management activities at the CSIR. The study revealed that AI and intelligent robotic machines can be used in the improvement of records management activities and can manage records effectively at the CSIR. The study proposed a framework on the usability of AI for the improvement of records management activities at the CSIR. It is hoped that the framework proposed will serve as a guideline on the usability of AI for the improvement of records management activities in the archives and records management sector.

Keywords: Usability, artificial intelligence, records management activities, perceived ease of use, attitude towards use, Council for Scientific and Industrial Research

1. Introduction and background

Usability of artificial intelligence (AI) for the management of records plays a significant role in making sure that records management actives are improved and managed effectively and efficiently. However, usability issues are crucial in many AI systems, where human intelligence (HI) works with the system to work out and apply particular results (as with speech system). AI is also applied in some systems to build a computer model of the user's need and optimise the interface (as in computer-aided instruction system and adaptive system) (Davenport & Kalakota 2019). The concept "usability" was developed some decades ago to substitute the concept "user-friendly" which, by the early 1980s, had developed a multitude of unpleasantly unclear and subjective implications (Nielsen 2012; Karlsson 2016). Nevertheless, in the prevailing years, the term "usability" itself has become diminished as the concept was envisioned to succeed. According to Karlsson (2016), usability is as an activity of the ease of

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use involving learnability, when relevant and the suitability of the item, and would determine the actual usability by a specific user for a specific duty in a specific setting.

The term "usability" is a concept in the Technology Acceptance Model (TAM) that refers to an activity of the ease of utility involving learnability when the appropriate item is used to determine the usage by users and activities in a particular environment (Harpur 2013; Karlsson 2016; Knox et al. 2021). TAM was developed in 1986 by Fred Davis in his doctoral study titled, "A technology acceptance model for theoretically testing the novel end-user information systems: theory and results". TAM is an information technology framework to comprehend users' utilisation of developing technologies, especially in the office environment, and has been tested in older population (Davis 1989). The theory suggests that an individual's interest to use technology (technology acceptance) and their usage behaviour (actual usage) of a type of technology are predicted by their perception of a particular technology's usefulness (benefits from using technology) and ease of use (Ratten 2020; Knox et al. 2021). For the purpose of this study, the central focus was on the concept "usability" as the researcher intended to investigate the usability of AI for the management of records at the CSIR. Usability further refers to whether AI would be effective when applied and utilised in the management of records at the CSIR. Ease of use regulates whether an item can be utilised, and acceptability checks whether it will be utilised and how it will be utilised. Ease of use in a specific setting is determined by the item qualities and is measured by user performance and satisfaction (Nielsen 2012). The concept of usability in this study intends to investigate if the AI would be usable for the improvement of records management activities at the CSIR in South Africa, an institution with headquarters in Pretoria, South Africa.

1.2 Contextual setting

The CSIR is a research and innovation institution in South Africa established by the Scientific and Industrial Council Act, No. 33 of 1945. Section 4(d) of this Act states that the functions of the CSIR are to publish information pertaining its operations and create hubs for collection, dissemination and preservation of information about research. The CSIR undertakes directed, multidisciplinary research and high-tech invention that subsidises the development of the quality of life for South Africans (CSIR 2018). The organisation makes a positive contribution to sustaining the government's initiatives via absorbed research relating to the country's developmental priorities, the institution's directives and its science, engineering and technological capabilities (CSIR 2018). The institution adds value in the global hemisphere regarding research and innovation and improves the economy of the country through its position in the world in terms of research and innovation (Matroko, Mniki & Van Deventer 2007). The CSIR houses a large number of records due to the rising number of research projects driven by economic development and the social infrastructure developments taking place in South Africa (Matroko et al. 2007). The CSIR produces research records, receives records from various institutions such as the Department of Science and Technology and Armscor and made a tremendous effort to ensure there are resources to manage records effectively and efficiently (CSIR 2018; Modiba 2021; Modiba 2022).

2. Literature review

This section provides a review of the literature on the usability of artificial intelligence for the management of records and improvement of records management activities.

2.1 Usability of artificial intelligence for the management of records through the lens of the TAM

This section reviews literature on the usability of AI for the improvement of records management activities based on TAM concepts, which are as follows perceived ease of use and attitude towards use.

2.1.1 Perceived ease of use

Perceived ease of use determines whether the utilisation of AI would be free of efforts when used to manage records. Perceived ease of use is a concept of Davis's (1989) original TAM model established through seven self-report questionnaire items explained as "the extent to which an individual believes that utilising certain system would be free of error". If the application is professed to be more flexible to utilise than another, users would be more inclined to accept it (Jahangir & Begum 2008). Perceived ease of use would influence attitude toward use, behavioural intention to use and actual use. Perceived ease of use also affects the next main concept, professed usefulness (Pinho & Soares 2011). Therefore, for AI to be adopted and utilised for the management of records, it should be easy to use.

Ilachiniski (2017) and Woordward (2018) explain that a possible utilisation of AI is compliance. Organisations usually have limited time to amass all records needed for an audit. It is certainly an agitating and error-prone process for HI, but AI can be skilled and programmed to identify keywords, labels or patterns that classify records as pertinent for compliance purposes, and then retrieve them from a repository in minutes (Lohr 2011; Jin Ma, Jin Gam & Banning 2017). Moreover, Keily and Hamm (2013) indicate that AI could help with data quality, which is a quandary troubling every organisation. This could cause replication and deter the capability of organisations to obtain a full opinion of their imperative data (Keily & Hamm 2013). With machine learning, computers and intelligent robotic machines can be skilled to search for ZIP encryptions that are typed into date fields or records that have an identical address but various names. The devices can robotically correct many of these errors, allowing organisations to meaningfully advance the quality of their data (Weckerk & McDonald 2007; West 2015; Maderer 2017). This ensures that the utilisation of AI is free of efforts when managing records at the CSIR.

2.1.2 Attitude towards use

The approach that records management practitioners adopt for the management of records would determine if the utilisation of AI would be effective and efficient. The TAM illustrates that the person's attitude towards utilising technology would regulate their intention to utilise a technology. Such attitude is successively determined by the technology's perceived ease of usage and perceived usefulness (Davis 1989). Pinho and Soares (2011) explain that organisations have attempted to apply AI to the duty of records management for more than 20 years, in most cases without success. One of the major inhibitors to utilising AI in records management has been the repetitious and time-consuming methods of training the computer algorithms to look for unequivocal mechanisms and the resistance of records management practitioners to using AI for the management of records (Jin Ma et al. 2017).

Gill (2019) professes that people are concerned that the utilisation of AI for records management would put records management practitioners out of work. However, it is likely that records management practitioners would be pleased to get rid of time-consuming activities, which would allow them to focus more of their workday on higher-value objectives. AI and machine learning algorithm have eventually moved beyond the territory of theoretical

probability to real-world application; therefore, institutions across the world should investigate possible ways of applying AI for records management (Gill 2019). Like other organisations, the CSIR might also be experiencing human errors that occur when capturing data that describe records that are available in the organisations. Therefore, the attitude of the records management practitioners would determine whether AI were utilised effectively to manage records at the CSIR.

2.2 Usability of artificial intelligence on the improvement of records management activities

Records management refers to a cluster of functions that are vital for scientifically regulating the creation, circulation, usage, conservation and disposition of recorded information preserved as evidence for commercial functions and operations (Adu 2014). Records management is the field of management responsible for the competent and systematic control of the creation, reception, preservation, use and disposition of records, comprising the procedures for understanding and preserving evidence of and information concerning the commercial functions and transactions in the process of records (Palmer 2000; ISO 15489-1 2001b). Records management is based on the theories that refer to the life cycle of records and the records continuum. Jin Ma et al. (2017) and Woordward (2018) articulate that the machine learning algorithm can be utilised to manage records and dispose of records that are no longer needed or are duplicates. These big data-optimised machines succeed in capturing millions of records in many organisations in America (Ripcord Company 2019). It is easy for AI and intelligent robotic machines to identify, flag and robotically delete replicas. The machine learning algorithm can also distinguish entities such as date fields to be used in records retention (Lohr 2011).

The usability of AI is based on how records management activities are managed through the utilisation of AI. AI should ensure that the records management activities are carried out effectively and efficiently. Theories of records management play a crucial role in determining the usability of AI for the effective management of records. The utilisation of AI plays a crucial role during the records life cycle and records continuum since machine learning algorithm, deep learning algorithm and natural language processing algorithm can be used to create digital records, automated records classification, automated records preservation and maintenance and provision of cloud storage and digital archives for effective safeguarding of digital records. AI can also ensure that disposal of records takes place through the use of intelligent robotic machines automated. Digital records can also be retrieved through the embedded computer technology that would allow the records practitioners to retrieve records, regardless of their location (Modiba 2021).

3. Problem statement

It is uncertain whether the usability of AI for the management of records at the CSIR would improve the records management activities at the CSIR. There is a view that the utilisation of AI would cause the practitioners from different spheres of life to lose their jobs since AI would be used to perform the service those practitioners were supposed to perform (Shalamanov 2021). This also includes records management practitioners at the CSIR. As a result, this might negatively impact the usability of AI for the improvement of records management activities at the CSIR. The other challenge might be that most records management practitioners have not used AI for the management of records before. Therefore, they might lack the skills and knowledge of how AI can be used to manage records effectively and efficiently. For that reason, the use of AI might not make the desired impact in the improvement of records

management services at the CSIR. Hence, this study investigates the usability of AI for the improvement of records management activities at the CSIR. The study further recommends a framework for the usability of AI for the improvement of records management activities at the CSIR. The framework will assist the records management practitioners in different organisations to be able to use AI for the improvement of records management activities.

4. Purpose of the study

The purpose was to investigate the usability of AI for the improvement of records management activities at the CSIR in South Africa.

5. Objectives of the study

Objectives of this study were to:

- assess the usability of AI in the improvement of records management activities
- propose a framework on the usability of AI for the improvement of records management activities at the CSIR in South Africa.

6. Research methodology

The convergent mixed methods research was applied and data were collected using interviews and questionnaires. The study also deployed the pluralism ontological perspective and pragmatism as the epistemological perspective. The convergent design was selected so that the researchers could collect both qualitative and quantitative data at the same time from the participants, analyse it independently and mix the responses during data interpretation. The study further used parallel sampling as the sampling technique to collect both the qualitative and quantitative data from the same population using different samples (Creswell & Creswell 2018; Creswell & Plano-Clark 2018). Records management practitioners and record managers were the population of this study. They provided their knowledge, expertise and expectation on the utilisation of AI for the management of records. The population of this study consisted of a sample size of eight participants, comprising one portfolio manager, one records manager, three professional repositories and indexers, two archives technicians and one data librarian at the CSIR. The portfolio manager and records manager contributed qualitative data in this study through interviews. The interview questions were structured and the interview was conducted through Microsoft Teams since data were collected during the Covid-19 pandemic. During the interview, the participants were asked about their views of the usability of AI for the management of records at the CSIR. Three professional repositories and indexers, two archives technicians and one data librarian contributed quantitative data to this study by means of the questionnaires. The researcher used both open- and close-ended questions to answer questions on the usability of AI for the improvement of records management activities at the CSIR. Open-ended questions allowed the respondents to express themselves on the usability of AI for the improvement of records management activities at the CSIR in South Africa. This study focused on the CSIR headquarters in Pretoria because records are only deposited and managed at the headquarters. The researcher covered the research records of the CSIR because the management of such records contributes holistically to how the CSIR participates in the global dispensation against their peers in the research and technological innovation fraternity. The study was only conducted at the headquarters of the CSIR and only records management staff based at the head office were involved. Records management staff at regional offices were not included in this study.

7. Findings of the study

This section presents the findings of the study.

7.1 Usability of artificial intelligence on the improvement records management activities

The usability of AI has the capability to improve the records management services at the CSIR. Based on this statement, the respondents were asked if it was possible to improve the records management activities at the CSIR with AI. Table 1 presents the findings of the study, which are summarised as follows.

- Six respondents agreed that through AI, records would be managed effectively, one disagreed and none of the respondents were unsure.
- Five respondents agreed that AI could provide reliable storage facility, three were unsure and one disagreed.
- Four respondents agreed that AI could facilitate adequate records classification, five were unsure and none disagreed.
- Five respondents agreed that AI could provide adequate maintenance of records, one was unsure and one disagreed.
- Five respondents agreed that AI provides adequate security and movement tracking of records, one was unsure, while one disagreed.
- Five respondents also agreed that AI provides effective disposal of records, one was unsure and one disagreed.

Table 1: Usability of artificial intelligence on the improvement of records management activities (N=6)

USABILITY OF ARTIFICIAL INTELLIGENCE ON THE IMPROVEMENT OF RECORDS MANAGEMENT ACTIVITIES		**RATINGS**		
		AGREE	**UNSURE**	**DISAGREE**
Records will be managed effectively	No	6	0	1
Provide reliable storage facility	No	5	3	1
Facilitate adequate records classification	No	4	5	0
Provide adequate maintenance of records	No	5	1	1
Provide adequate security and movement tracking of records	No	5	1	1
Provide effective disposal of records	No	5	1	1

NOTE: No = Number

The participants indicated that AI could improve the digitisation process and quality of records, records would be retrieved faster and AI has the cloud storage capacity and would assist in the maintenance of records. The following were the responses of the participants:

Participant 1 stated that "AI captures data faster than HI. AI retrieves records faster, has storage capacity and maintenance will be improved by flacking records that are corrupt".

Participant 2 stated that "AI will automatically classify records, scan records faster and provide reliable access control".

8. Discussion of the study

This section discusses the findings of the study.

8.1 Usability of artificial intelligence on the improvement for records management activities

The usability of AI has the potential to improve records management activities at the CSIR. Moreover, it has the capability to perform records management activities better than HI. AI can do much work that HI struggles to perform and can do it better and faster than HI. What HI can do in days, AI can do in minutes (Ripcord Company 2019). Hence, six respondents agreed that by means of AI, records at the CSIR could be managed effectively. This might be because AI is capable of scanning records faster. In addition, AI can retrieve records quicker and performing automated classification of records. AI is programmed to determine and flag records due for disposal. AI would be programmed to identify when the retention period of records expires and delete the record on the system.

Moreover, the majority of five respondents also agreed that AI could provide adequate maintenance of records. This might be because AI is programmed to update records that were captured and ensure that records are kept safe. AI could also provide a reliable storage facility. This might be because AI is embedded in a cloud storage facility that could store an unlimited number of records. Four respondents agreed that AI could facilitate adequate records classification. AI has the capacity to auto-classify records and store them under similar subjects. However, one respondent disagreed that AI could provide reliable storage and maintenance.

Participants responded that AI had the capability to capture data faster than HI. AI could retrieve records faster and had a reliable storage facility. It also had the capacity to maintain records by flagging records that were corrupt.

9. Recommendation

This section gives recommendations on the usability of AI for the improvement of records management activities at the CSIR. AI should be user-friendly so that it would ensure that there is improvement in the management of digital records at the CSIR. Records management practitioners should not struggle to digitise and transfer records through embedded automated classification algorithm. AI should also ensure there was an improved cloud storage facility for the digital records. AI should be programmed in such a way that it would detect and flag records that need maintenance. AI should then be able to detect viruses that have the ability to corrupt the digital records and remove the threats posed by the viruses so that the digital records would remain protected. AI should also improve the retrieval of digital records through databases

embedded in intelligent robotic machines, accessibility and irretrievability devices such as a laptop/desktop, tablet and cellular phone.

This study further recommends a framework on the usability of AI for the improvement of records management activities. It is hoped that this framework would help other research institutions to assess the usability of AI and intelligent robotic machines for the improvement of records management activities. The usability of AI and intelligent robotic machines should reflect during records management activities such as records creation, records classification, records maintenance and records disposal. Usability would ensure that records management activities are improved and managed effectively and efficiently.

9.1 Proposed framework

This section presents the framework on the usability of AI for the improvement of records management activities at the CSIR, as illustrated in Figure 1. Figure 1 illustrates the flows from AI, usability and effective records management. The models referred to are known for technology acceptance as far as usability and using AI for effective records management are concerned.

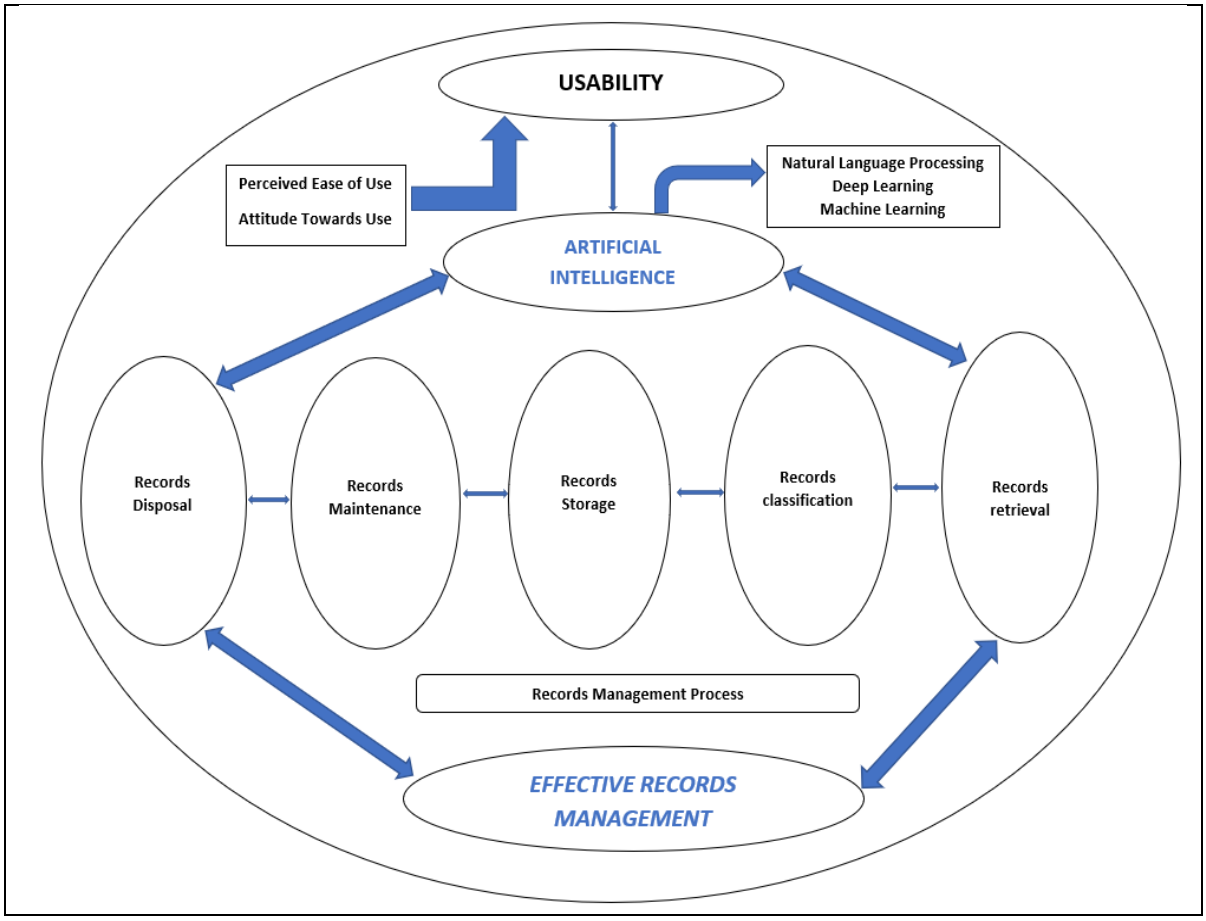

Figure 1: Framework for usability of artificial intelligence in improving records management activities

This model begins with the perception that AI can manage records effectively and efficiently to ensure that records management activities at the CSIR are improved. The framework articulates how AI can improve the management of records at this institution. Usability is based

on the perceived ease of use and attitude towards the use of AI and intelligent robotic machines to improve the records management activities. AI should be easy to use in various sections of the records management activities (records retrieval, records classification, records storage, records maintenance and records disposal). Ease of use becomes evident when the records management practitioners retrieve records using AI and intelligent robotic machines. Records management practitioners will also develop a positive attitude towards using AI for the improvement of records management activities. AI-empowered databases, programs and software will be used to retrieve records through machine learning algorithm. Such programs will be used effectively to retrieve records easier and quicker. It should be easy to use AI and intelligent robotic machines to perform automated digitisation and classification of records at the CSIR. Through AI-empowered software and programs, records will be auto-classified according to subject before being stored in cloud storage facilities. Digital records with errors should be identified through machine learning and deep learning algorithm and robotically removed from the cloud storage facility. The AI-embedded software and programs will be programmed in such a way that it will detect the life span of records and delete digital records that are due for disposal. Records of value will robotically be moved to the digital archives for archival purpose. The usability of AI-empowered programs and intelligent robotic machines will ensure that records are improved and effectively and efficiently managed at the CSIR, and quality services are provided to the users.

10. Conclusion

In conclusion, the usability of AI is evident in the improvement of records management activities at the CSIR in South Africa. AI can manage the records effectively and efficiently at the CSIR due its capabilities since it uses AI, such as automated classification, natural language processing (NLP), deep learning, machine learning algorithms and robotic machines. The algorithms are used to create multiple digital records, provide effective maintenance of digital records and preserve the digital records effectively and efficiently. AI has the potential to provide reliable storage facilities since cloud storage is embedded in the intelligent robotic machines. AI also has the potential to provide adequate security of records and movement tracking of records through the use of encrypted passwords and security codes. AI is also able to provide effective automated disposal of records and ensure that records with archival value are through transferred to the digital archives intelligent robotic machines. Active digital records can be retrieved through computer technology which is connected to the cloud storage, local servers and the digital archives for easy access of records at the CSIR in South Africa.

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