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Utilising an AI chatbot to support smart digital government for Society 5.0 in South Africa

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Background: The use of artificial intelligence (AI) chatbot can be fundamental to supporting the establishment and maintenance of smart digital government for Society 5.0 across all national government departments in South Africa. In this way, the AI chatbot can ensure that government services are incorporated and provide quality services to smart citizens. As such, smart citizens can use an AI chatbot to access government services, regardless of the place and time.

Objectives: The purpose of this study is to investigate the use of an AI chatbot to establish smart digital government for Society 5.0.

Method: This qualitative study adopts content analysis as its research methodology, which is grounded in a literature review that integrates insights from the researchers' experiences with the use of an AI chatbot to support smart digital government in Society 5.0.

Results: The findings of the study reveal that an AI chatbot has the potential to provide government information and services around the clock, regardless of where they are and the time they want to access these services. This can allow citizens to access and retrieve government services timeously. Through an AI chatbot, citizens can access and retrieve information and services from various government databases and websites, promptly.

Conclusion: This study provides a framework to map how an AI chatbot can be utilised to support smart digital government for Society 5.0.

Contribution: The framework of this study would help the government including national government departments to integrate an AI chatbot in their databases, to ensure that smart digital services are provided to citizens.

Keywords: artificial intelligence chatbot; government databases; government systems; government services; smart digital government; Society 5.0.

Introduction

The persistent lack of proper information technology infrastructure across national government departments in South Africa hampers smart digital government service delivery and the needs of society 5.0. According to Mishra, Thakur and Singh (2022), Society 5.0 is a smart society, conversant with the use of cutting-edge technology to access various services digitally. Smart digital government is suitable for this kind of society because they can access government services digitally, using technology such as Artificial Intelligence (AI) chatbots, to interact with government services. Society 5.0 is characterised by the seamless integration of cyberspace or digital technologies and physical space or real-world environment to create a human-centric society that addresses societal challenges and enhances the quality of life. In this era, AI, and human intelligence (HI) collaborate, to ensure that certain government services are provided and accessed digitally and in real-time (Mishra et al. 2022).

The use of AI chatbots can be fundamental in supporting the establishment and maintenance of smart digital government for Society 5.0. The AI chatbots can be used to ensure that government services are incorporated and provide quality services to smart citizens (Chen, Gascó-Hernandez & Esteve 2023). Smart citizens can use AI chatbots to access the services in government, regardless of the place and time the services are accessed. An AI chatbot is a computer programme designed to simulate conversation with human users through text or voice interactions. These AI chatbots utilise various AI algorithms such as natural language processing (NLP), machine learning and

deep learning, among others, to understand and respond to user queries or prompts in a conversational manner (Antopoulos et al. 2016). Artificial Intelligence chatbots provide users with a seamless and efficient process to interact with web-based systems or access information, by emulating human-like conversation in the Society 5.0 era.

The smart digital government refers to a government system that utilises advanced digital technologies such as AI chatbots and data-driven approaches to enhance its efficiency, transparency, accessibility and responsiveness in delivering public services and governing the nations (Aoki 2020). Such a government embraces digital technologies such as AI, cloud computing, the Internet of Things and blockchain technology, to modernise government operations, streamline processes and improve service delivery. Smart digital government also leverages vast amounts of data, collected from various sources, to gain insights, inform policymaking and improve governance, and such data can be collected through the AI chatbot system that engages with the citizens (David et al. 2023). However, smart digital government has the responsibility to implement robust cybersecurity measures and privacy regulations, to safeguard government systems, citizens' data and sensitive information from cyber threats and unauthorised access. The smart digital government aims to harness the transformative power of digital technologies to create more efficient, transparent and citizen-centric governance systems that better serve the needs of Society 5.0 (Eom & Lee 2022).

Currently, systems in government are not integrated and streamlined, and this makes it difficult to access government services. Government systems are working and accessed in isolation because they are not talking to each other. Even when accessing government services, they are accessed in isolation (David et al. 2023). Therefore, it makes it difficult for current citizens to access government services easily and faster, because they will have to move from one department to another to access the services they want. In most countries, access to such services even involves travelling from one department to another and, sometimes, citizens will have to wait in long queues to access the services (Gkeredakis, Lishitz-Asaf & Barrett 2021). Occasionally, systems in government are not working and this affects access to services. Therefore, it has become imperative to use AI chatbots to ensure timely and quicker access to government services. Government services can be automated, so that they can be accessed digitally (Fischer et al. 2023). This will ensure that there is improved service delivery in various countries. Hence, this study intends to investigate the use of AI chatbots to support smart digital government for Society 5.0.

Problem statement

The issue prompting this study is the lack of digital integration among national government departments in South Africa, which result in citizens being unable to access services. Currently, citizens face significant barriers when attempting to apply for essential documents such as identity documents (IDs), passports, driver's licences and car permits, or even when seeking employment opportunities in the various departments and municipalities (Sanders et al. 2020). While some departments offer limited digital services, many still rely on manual processes, requiring citizens to physically visit offices, leading to long queues and accessibility challenges (Sanders et al 2020). Consequently, citizens have also shared their frustration experience and inconvenience in accessing crucial services, even in areas such as healthcare facilities as they are required to make in-person visits, as opposed to conduct some services digitally or online. This inefficiency in digital service delivery tends to lead to public discontent, manifested through protests that may adversely impact the nation's economy, because of damage to state infrastructure and resources (Gkeredakis et al. 2021).

The implementation and use of AI chatbots in South Africa presents a solution to the identified challenges mentioned in this article, whereby facilitating the digital integration and accessibility of government services. With AI chatbots, citizens can conveniently access a wide range of government services, irrespective of the geographical location and time factor. This includes applying for government positions, participating in virtual interviews, undergoing digital screenings, signing contracts remotely and even performing work tasks digitally, including submitting reports and delivering services (Fischer et al. 2023). Moreover, citizens can digitally apply for IDs and permits, with departments issuing digital documents for self-printing or facilitating courier delivery. AI chatbots can also serve as a communication channel, providing updates on application statuses and allowing citizens to make inquiries or follow-ups regarding requested services (Gkeredakis et al. 2021).

Leveraging on AI chatbot technology, governments departments in South Africa can ensure the provision of efficient and accessible digital services to citizens that align with the principles of smart governance for the advancement of Society 5.0. It is on this premise, that this study aims to explore the utilisation of AI chatbots in supporting the transition towards a smart digital government establishment in South Africa.

Purpose of the study

The purpose of this study is to investigate the use of an AI chatbot to establish a smart digital government for Society 5.0. In carrying out this study, the following research objectives were considered, namely:

- *Assess the functions of the AI chatbot to support the smart digital government for Society 5.0 in South Africa.*
- *Evaluate the AI infrastructure required to use a chatbot that supports smart digital government for Society 5.0 in South Africa.*
- *Assess the skills required to use an AI chatbot to support smart digital government for Society 5.0 in South Africa.*
- *Evaluate the merits of the use of AI chatbots to support smart digital government for Society 5.0 in South Africa.*

- *Determine drawbacks of the use of AI chatbots to support smart digital government for Society 5.0 in South Africa.*
- *Analyse the ethics of AI chatbots to support smart digital government for Society 5.0 in South Africa.*
- *Propose a framework to use AI chatbots to support smart digital government for Society 5.0.*

Literature review

The literature review conducted for this article was based on information sourced from different databases in developing the literature for the following sub-themes on the functions of AI chatbots to support the smart digital government for Society 5.0; AI infrastructure required to establish a chatbot to support the smart digital government for Society 5.0; skills required to use an AI chatbot to support the smart digital government for Society 5.0; the merits and drawbacks of the use of an AI chatbot to support the smart digital government for Society 5.0 and the ethics of AI chatbot to support the smart digital government for Society 5.0.

Functions of artificial intelligence chatbots to support smart digital government for Society 5.0

By function of AI chatbots in this context, the researcher implies computer programmes that use machine learning (ML) and natural language processing (NLP) used by government departments to engage with users in an effective and efficient way. In the context of Society 5.0, which emphasises the integration of advanced technologies such as AI for the betterment of society, AI chatbots can play several crucial roles in supporting smart digital government initiatives (Anthopoulos et al. 2016). In this way, AI chatbots are lauded for providing round-the-clock assistance to citizens seeking information or services from government agencies and departments. This ensures accessibility and convenience for citizens, regardless of the time of day. Through AI chatbots, smart citizens can also have access to services that are offered by various departments and parastatals, for instance, the departments of health, transport, home affairs and judicial services, as well as to the offices of the Public Protector and Auditor General. Such smart services can be accessed at anytime and anywhere, through an AI chatbots (Aoki 2020).

Artificial intelligence chatbots can quickly retrieve relevant information from government databases or websites in response to citizen enquiries. This includes information on government policies, procedures, services and regulations. Through AI chatbots, information about government departments, agencies and parastatals can be accessed easily and quickly (Chen et al. 2023). Citizens would not have to physically visit government offices to retrieve certain information. Such information can be retrieved from government databases through an AI chatbot that is downloaded on their smartphones. Citizens can also use nearby internet cafés and libraries to retrieve information from AI chatbots. Artificial intelligence chatbots serve as an efficient channel for disseminating timely and accurate information about government policies, programmes, events and initiatives to citizens, to ensure transparency and awareness (Mishra et al. 2022).

Citizens can use AI chatbots to submit service requests, such as applying for permits, licences or social aid. Artificial intelligence chatbots are capable of guiding users through the application process, collecting the necessary information and providing updates on the status of their requests. Citizens would not have to queue at traffic departments to apply for drivers or car permits or licences, because they can use AI chatbots to apply for such documents. Artificial intelligence chatbots can easily demonstrate to citizens, who lack the skills, the steps they must follow to apply for such services. Artificial intelligence chatbots can also automate routine tasks and transactions, such as form submissions, permit applications and information requests; thereby, streamlining processes and reducing the administrative burden on both citizens and government staff (Anthopoulos et al. 2016).

Artificial intelligence chatbots can collect feedback from citizens about government services or gather complaints about issues they encounter. This feedback can be used to improve service delivery and address citizen concerns more effectively. The citizens can use the AI chatbots to communicate their frustrations about the services they get from the government. This can help the government to respond to critical issues based on the services they provide. Artificial intelligence chatbots can also facilitate meaningful interactions between citizens and government agencies, by providing avenues for feedback, enquiries and participation in decision-making processes. Artificial intelligence chatbots are used to analyse citizens' interactions and feedback, to generate actionable insights for government agencies, enabling data-driven decision-making processes and continuous improvement of services. Artificial intelligence chatbots can also aid in identifying common issues or areas for improvement in service delivery (Mehr 2017).

Artificial intelligence chatbots, equipped with NLP algorithms capabilities, can support multilingual interactions, which will allow citizens to communicate with government agencies in their preferred language. In South Africa, for example, all the official languages can be used to interact with the AI chatbot. This will help to ensure that everyone can interact with the AI chatbot, in their preferred language, to have access to government services. AI chatbots with multilingual capabilities can break language barriers and cater to the diverse linguistic needs of citizens, to ensure inclusivity and accessibility for non-native speakers (De Felice, Travaglioni & Petrillo 2021).

Artificial intelligence chatbots can educate citizens about government policies, initiatives and programmes; in this way, helping to increase awareness and understanding of public services and their benefits. If citizens want to know about any policy, they can use it to read about them. Citizens can also ask clarification questions, on which they can provide feedback (Mehr 2017). During emergencies or crises,

AI chatbots can disseminate critical information, provide updates on the situation and offer guidance on necessary actions citizens should take. As the personal details of all citizens including their contact details can be collected through AI chatbots, it can be used to send direct communication to the citizens, especially during crisis and emergencies. During emergencies or crises, it can deliver real-time updates, safety instructions and emergency services information to citizens, to help mitigate risks and ensure public safety (Gesk & Leyer 2022).

Artificial intelligence chatbots, equipped with NLP algorithm capabilities, can enhance accessibility for citizens with disabilities or limited literacy, by supporting voice commands and providing alternative communication channels (Song 2023b). The AI chatbot has functionalities and features that can also help disabled citizens to access the information they require from government agencies (Baeroe, Miyata-Sturm & Henden 2020). Artificial intelligence chatbots can also integrate with other government systems and databases to access and update information in real-time; thus, facilitating seamless collaboration and interoperability between different government agencies and departments. The integration of governmental systems through AI chatbots can ensure that citizens have access to all the departmental information, at their fingertips. It can significantly enhance the efficiency, accessibility and responsiveness of smart digital government services in Society 5.0; ultimately, leading to better citizen satisfaction and engagement with the government (Mellouli, Janssen & Ojo 2024).

Artificial intelligence infrastructure required to use chatbots that support smart digital government for Society 5.0

Artificial intelligence infrastructure has to do with a combination of hardware, software, data systems and tools that are required by government departments to deploy AI models and applications. These infrastructures are essential to support an AI system to function adequately (Mellouli et al. 2024). As such, establishing an AI infrastructure to support a chatbot for smart digital government initiatives in Society 5.0 involves several components and considerations. Universal access to high-speed internet is a fundamental component to be considered for enabling digital interactions between citizens and government services. The government should expand and optimise broadband infrastructure to ensure reliable connectivity, especially in rural and underserved areas. The availability of high-speed internet connections will enable citizens to access the AI chatbot to obtain information or a service from the government. Therefore, the government must ensure that high-speed internet connectivity is prioritised, so that citizens would not struggle to access the AI chatbot (Mellouli et al. 2024).

The NLP algorithm is also required to ensure that the AI chatbots can converse with the citizens through official languages in the country. The government should select a robust NLP framework or library that supports the languages spoken in their country. In South Africa, for example, such languages include English, Northern Sotho, Southern Sotho, Setswana, Tshivenda, Tsonga, Zulu, Xhosa, Afrikaans and others. In this regard, the local government should also ensure that the NLP model is trained on relevant datasets that include South African government-related text and conversations. Natural language processing algorithms such as TensorFlow, PyTorch or SpaCy, can be utilised to enable the chatbot to understand and process natural language inputs from citizens and to have a comprehensive conversation with them (Van Noordt & Misuraca 2022).

The government should gather and annotate relevant datasets of government-related text data, including service manuals, policies and citizen enquiries, to train and evaluate the AI chatbot's performance (Van Noordt & Misuraca 2022). It is thus ideal to gather and annotate datasets of government-related text data languages spoken in various countries, including official documents, policies, service manuals and citizen enquiries. This will ensure that the data-collection process is inclusive and representative of the linguistic diversity of the country (Gesk & Leyer 2022). The government should design and implement a dialogue management system to manage the flow of conversations between the AI chatbot and citizens, including handling context, intents, entities and multi-turn dialogues. They should design and implement a dialogue management system that can handle conversations in multiple languages, including code-switching and transliteration between languages. The government should also consider the cultural nuances and communication styles prevalent in their country when designing the dialogue flow (Song 2023a). They must also integrate the AI chatbot with existing government systems, databases and APIs, to access relevant data and information needed to respond to user queries and facilitate transactions (Baeroe et al. 2020).

The government should deploy trained machine learning models to production environments, using containerisation technologies such as Docker or Kubernetes, to enable real-time inference and serving of chatbot responses. They should also deploy trained machine learning models to production environments hosted on cloud platforms or local servers, while also ensuring that the infrastructure complies with data sovereignty and privacy regulations in various countries (Song 2023b). Government should implement continuous integration and deployment pipelines to automate the process of testing, deploying and updating the chatbot's AI models and codebase, ensuring reliability, scalability and maintainability. They should also implement continuous considerations for language-specific testing and localisation (Chen, Chen & Lin 2020).

Skills required to use artificial intelligence chatbot to support smart digital government for Society 5.0

Skills to use AI chatbots implies those elements that workers in government departments need in order to fulfil obligations assigned to them effectively. Therefore, to

effectively use AI chatbots to support smart digital government initiatives in Society 5.0, departments should ensure that individuals and teams acquire or possess diverse set of skills that spans the technical, communication and strategic domains (Song 2023b). Comprehending the technical aspects of AI chatbot development, including NLP, machine learning algorithms and chatbot frameworks, is essential for designing, implementing, and maintaining chatbot systems (Gallway & Swiatek 2018). Therefore, the government needs a strong team of technical experts to ensure that the AI chatbot performs what it is designed to perform, effectively and efficiently (Gallway & Swiatek 2018). Proficiency in programming languages, such as Python, Java, or JavaScript, is crucial for developing and customising AI chatbots, integrating them with other systems and implementing advanced features and functionalities. The government will need a capable team of ICT experts or programmers to ensure that all government systems and services are integrated into the AI chatbot so that services from all government departments, agencies and parastatals can be accessed through it (Van Noordt & Misuraca 2022).

Government staff should be able to understand user experience (UX) design principles and methodologies, as this is important for creating intuitive and user-friendly chatbot interfaces that enhance citizen's engagement, satisfaction and effectiveness. The staff should have the ability to evaluate the user experience and gauge the level of their satisfaction. This will help the government to improve the services the citizens are not satisfied with (Song 2023b). Strong verbal and written communication skills are required for effectively communicating with stakeholders, gathering requirements, explaining chatbot functionalities and providing user support and guidance. The government will have to embark on a nationwide communication drive, to educate the citizens about the functions of AI chatbots, especially on how to use them effectively. Therefore, there is a need for government officials to have communication skills, so that they can engage meaningfully with the citizens (Song 2023b).

Skills in project management, including planning, organising, resource allocation and time management, are necessary for managing chatbot development projects from inception to deployment and beyond. The government must assemble a team of people with project management skills to ensure that the establishment and implementation of AI chatbots are effective and flawless (Gallway & Swiatek 2018). All the necessary skills and resources must be gathered before designing an AI chatbot that the government can use to provide services. Therefore, a project manager with a competent team must be employed (Folstad & Taylor 2021). Given the rapidly evolving nature of AI technologies and government policies, individuals working with AI chatbots need to demonstrate adaptability and a willingness to learn new tools, techniques and best practices. The ICT responsible for managing the AI chatbot must always research new functions and tools that can keep the AI chatbot effective. If updates are needed, they must be activated so that the AI chatbot will always be effective in providing quality digital services to the citizens (Mishra et al. 2022).

Merits of the use of artificial intelligence chatbots to support smart digital government for society 5.0

Merits of the use of AI chatbots have to do with perceived broad benefits or advantages that government departments may gain through in their bid to digitalise services to citizens. The merits of the AI chatbot utilisation stipulate that they are a powerful tool that would benefit both the government and the users (Pena-Cacerse et al. 2024). The use of AI chatbots to support smart digital government initiatives in Society 5.0 offers numerous merits and benefits, including the provision of round-the-clock assistance and information to citizens, ensuring accessibility to government services and resources, at any time, from any geographical location or time zone. Citizens will have access to government information and services promptly (Galloway & Swiatek 2018). Artificial intelligence chatbots can streamline government processes by automating routine tasks, such as answering inquiries, processing forms and providing information, leading to increased efficiency and convenience for citizens and government agencies alike (Leyer & Schneider 2021). By automating repetitive tasks and reducing the need for human intervention, AI chatbots can help government agencies save time, resources and operational costs, leading to more efficient use of taxpayer funds. Citizens will also save time and money, as it will not be necessary to travel to different departments to seek information and services, as such services can be accessed via AI chatbots (Maia, Vieira & Praca 2023).

Artificial intelligence chatbots can handle a large volume of user inquiries and interactions concurrently, making them scalable solutions for managing citizen engagement and service delivery, even during periods of high demand or peak traffic (Kaur, Gabrijelcic & Klobucar 2023). Artificial intelligence chatbots can provide personalised responses and recommendations, based on user preferences, past interactions and data analytics, enhancing the user experience and tailoring government services to individual needs (Chen et al. 2020). Artificial intelligence chatbots can provide an interactive and conversational interface for citizens, to engage with government services and information, fostering greater citizen participation, feedback and collaboration in governance processes (Song 2023b). Artificial intelligence chatbots can deliver real-time updates, notifications and alerts to citizens regarding government policies, events and emergencies, to ensure timely communication and responses to changing circumstances (Pena-Caceres et al. 2024). Artificial intelligence chatbots, equipped with NLP algorithm capabilities, can support multilingual interactions that allow citizens to communicate with government agencies in their preferred language; thus, promoting inclusivity and accessibility. These languages can include all the official languages in South Africa (Tomar et al. 2023).

Drawbacks of the use of artificial intelligence chatbots to support smart digital government for Society 5.0

While AI chatbots offer many benefits, there are also potential drawbacks and challenges associated with their use to support smart digital government initiatives in Society 5.0. The following are the drawbacks: AI chatbots may struggle to accurately understand and respond to complex or ambiguous user inquiries, leading to frustration and dissatisfaction among users, particularly when dealing with sensitive or urgent issues (Leyer & Schneider 2021). Overreliance on AI chatbots for government services may exacerbate existing digital divides, as certain segments of the population, such as the elderly or those with limited access to technology, may face barriers to accessing and using AI chatbot-enabled services (Chen et al. 2020).

Artificial intelligence chatbots require access to user data to function effectively, raising concerns about privacy and data protection. Governments will have to ensure that AI chatbots comply with relevant privacy regulations and robust security measures will have to be implemented to protect sensitive citizen information from unauthorised access or misuse. Legislation, such as the *Protection of Personal Information Act*, must be complied with to ensure data privacy (Maia et al. 2023). Artificial intelligence chatbots may unconsciously perpetuate biases present in training data or algorithms, which can lead to discriminatory outcomes in decision-making or service provision. Governments must proactively address issues of bias and ensure that chatbots are designed and trained to uphold fairness and equity (Song 2023b). While AI chatbots can offer efficiency and scalability, they may lack the empathy and comprehensive understanding of human interactions provided by human customer service representatives. This can lead to a loss of trust and satisfaction among citizens, particularly in sensitive or emotionally charged situations (Pena-Caceres et al. 2024).

Implementing and maintaining AI chatbots requires technical expertise and resources, including skilled data scientists, engineers and IT infrastructure. Governments may face challenges in recruiting and retaining talent, as well as in ensuring the scalability and reliability of AI chatbot systems over time. When looking for information and services, the unavailability of AI chatbot services can cause frustration for citizens (Kaur et al. 2023). The use of AI chatbots raises complex ethical dilemmas, such as issues of transparency, accountability and consent. Governments must navigate these ethical considerations carefully and ensure that AI chatbots are deployed and operated in a manner that upholds ethical standards and promotes trust and confidence among citizens (Kooli 2023). Artificial intelligence chatbots may present accessibility challenges for individuals with disabilities or limited digital literacy, particularly if they rely heavily on text-based interactions or lack support for alternative communication methods, such as voice or visual interfaces (Gesk & Leyer 2022).

Ethics of artificial intelligence chatbots to support smart digital government for Society 5.0

Ethics of the use of AI chatbots have to do with moral principles and practices that guide how they should be deployed and used by government departments (Nguyen, Ngo, Hong, Dang, & Nguyen 2023). The principles and practices must ensure that AI systems are used in ways that are safe, respectful of all human rights, ensure privacy and ethical manner (Pillai & Kumar 2021). The ethical considerations surrounding the use of AI chatbots to support smart digital government initiatives in Society 5.0 are crucial. As alluded by Pena-Caceres et al. (2024), the following are some key ethical principles that should guide the development, deployment and operation of AI chatbots in this context: Governments should ensure transparency in the design, development and deployment of AI chatbots, providing clear information to citizens about how the chatbots work, what data are being collected and how it is being used and what limitations or biases may exist in the AI chatbot's capabilities (Pillai & Kumar 2021). Clear lines of accountability should be established to ensure that government agencies are held responsible for the actions and decisions made by AI chatbots, including any errors, biases or unintended consequences that may arise (Gesk & Leyer 2022). Artificial intelligence chatbots should be designed and trained to provide fair and equitable treatment to all citizens, regardless of their background, characteristics or circumstances. Efforts should be made to identify and mitigate biases that may exist in training data or algorithms, to ensure that the chatbots do not discriminate against certain groups or individuals (Song 2023b).

Governments should prioritise the protection of citizen privacy and personal data while deploying AI chatbots by implementing robust data security measures and adhering to relevant laws and regulations governing data privacy and protection (Galloway & Swiatek 2018). Citizens should be provided with clear and understandable information about how their data are being used by AI chatbots and given the opportunity to provide informed consent for its use. Any data collection or processing should be conducted with the explicit consent of the citizens, and citizens should have the ability to opt out or withdraw consent at any time (Pena-Caceres et al. 2024). While AI chatbots can automate many tasks and processes, there should be mechanisms in place for human oversight and intervention to handle complex or sensitive situations, escalate issues as needed and ensure that ethical standards are upheld. This will ensure that the citizens are provided with relevant information and appropriate services (Kaur et al. 2023). Government should make efforts to identify and mitigate biases that may exist in AI chatbots, including biases in training data, algorithms or user interactions. Techniques such as fairness testing, bias monitoring and algorithmic auditing can help ensure that AI chatbots provide fair and unbiased outcomes (Chauncey & McKenna 2023).

Artificial intelligence chatbots should be designed and developed keeping ethical considerations in mind, incorporating principles such as fairness, transparency, accountability and respect for human dignity into every stage of the process. Ethical guidelines and frameworks should be followed to ensure that AI chatbots are deployed and operated in a manner that upholds the highest ethical standards and promotes the public good (Kooli 2023). By adhering to these ethical principles, governments can ensure that AI chatbots effectively support smart digital government initiatives in Society 5.0, while upholding the rights, dignity and well-being of all citizens.

Implementation of artificial intelligence chatbots to support smart digital government for Society 5.0

Implementation of the use of AI chatbots has to do with the process of putting the chatbots into action by government departments so that they can start interacting and rendering intended services to users (Pena-Caceres et al. 2024). Implementing an AI chatbot to support smart digital government initiatives in Society 5.0 involves several steps and considerations. Government must begin by identifying the specific government services or processes that could benefit from AI chatbot support. They then determine the goals and objectives of implementing the AI chatbot in government, such as improving citizen engagement, streamlining service delivery or providing round-the-clock support (Maia et al. 2023). The government will have to engage the relevant stakeholders, including government agencies, citizens, IT professionals and legal and privacy experts, to gather input, address concerns and ensure buy-in for the implementation of AI chatbots (Pena-Caceres et al. 2024). The government will also need to collect and analyse relevant data sources, including government databases, service manuals and citizen feedback, to train the AI chatbot and enable it to understand and respond to citizen queries effectively (Pillai & Kumar 2021).

The government will need to deploy the AI chatbot to production environments and make it accessible to citizens through various digital channels, such as government websites, mobile apps and social media platforms. They would have to communicate the availability and benefits of the AI chatbot to citizens through targeted outreach and marketing efforts (Chauncey & McKenna 2023). They will be duty-bound to also provide training and support to government staff responsible for managing and maintaining the chatbot, as well as for citizens who will be interacting with the chatbot to access government services. The government should also offer user guides, tutorials and helpdesk support to address user enquiries and issues (Stieglitz et al. 2022).

The government would need to evaluate the effectiveness and impact of the AI chatbot implementation in achieving its intended goals and objectives, such as measuring key performance indicators, such as citizen satisfaction, service delivery efficiency and cost savings, to assess the value of the AI chatbot initiative (Song 2023b). By following these implementation steps, governments can successfully implement AI chatbots to support smart digital government initiatives in Society 5.0, to enhance citizen engagement, service delivery and overall governance effectiveness.

Research methods and design

This qualitative study adopted content analysis as its research methodology, which is grounded in a comprehensive literature review that integrated insights from the researchers' experiences with utilising AI chatbots to support smart digital government for Society 5.0. Themes and keywords such as 'Artificial intelligence Chatbot', 'Smart digital government' and 'Society 5.0', guided the exploration of relevant literature. The literature review process involved utilising numerous search engines, including Google Scholar, ResearchGate, Web of Science, EBSCOhost, ScienceDirect, Springer and Sage, which were selected for their capacity to connect researchers with various websites that host pertinent information. The search was refined by using specific keywords, which resulted in a substantial number of literature sources. The researchers systematically traversed through search results, sifting through thousands of sources to identify and access literature relevant to the study.

Documents were identified and selected based on their relevance and utility to the study. Initial screening involved scrutinising titles and abstracts to eliminate duplicates. In the subsequent round, full-text articles that met the inclusion criteria underwent further review. The researchers employed thematic analysis, following Braun and Clarke's (2006) technique, to systematically analyse qualitative data or text from prior studies. This involved examining, synthesising and interpreting data by categorising them according to key research objectives related to the investigated topic. The collected and extracted data from included articles were summarised and recorded, to facilitate a contextual and meaningful understanding of the issues under investigation. The resulting findings were organised into thematic categories, such as 'Artificial Intelligence', 'Intelligence Chatbot', 'Smart Digital Government' and 'Society 5.0', which provided valuable insights into the integration of the AI chatbot to support smart digital government for Society 5.0.

Inclusion and exclusion criteria

This study conducted a systematic literature search to collect pertinent findings on utilising AI chatbots to support smart digital government for Society 5.0. The researchers used specific search terms, including 'Artificial intelligence chatbot', 'Smart digital government' and 'Society 5.0'.

The inclusion criteria for the study were as follows:

- Articles published between 2016 and 2024
- Empirical studies

- Articles written in English
- Publications in peer-reviewed scholarly journals

The exclusion criteria for the study were as follows:

- Articles that were not written in English
- Articles that did not focus on the use of AI chatbots to support smart digital government for Society 5.0
- Research that consisted of grey literature or non-peer-reviewed publications

To identify relevant scholarly works, the researchers initially screened abstracts to assess their alignment with the study's objectives. The search criteria were later refined to focus on subject areas specifically related to the use of AI chatbots to support smart digital government for Society 5.0, as these domains form the foundation of the study. The literature search was limited to English-language articles published between 2016 and 2024.

The following academic databases were used for the literature search:

- Google Scholar
- Web of Science
- EBSCOhost
- ScienceDirect
- Springer
- SAGE

Ethical considerations

Ethical clearance to conduct this study was obtained from the University of South Africa Department of information Science Ethics Review Committee (Rec- 240816-052).

Results

This section elucidates the key findings derived from the study, shedding light on the transformative potential of AI chatbots in delivering government services effectively and efficiently. The findings from the research indicate that AI chatbots offer the unprecedented capability to provide government information and services around the clock, transcending the constraints of time and location. This accessibility empowers citizens to swiftly access and retrieve essential government services, thereby enhancing timeliness and convenience. By tapping into various government databases and websites, citizens can effortlessly obtain information and perform tasks, without the need for physical visits or lengthy queues at government offices (Aoki 2020).

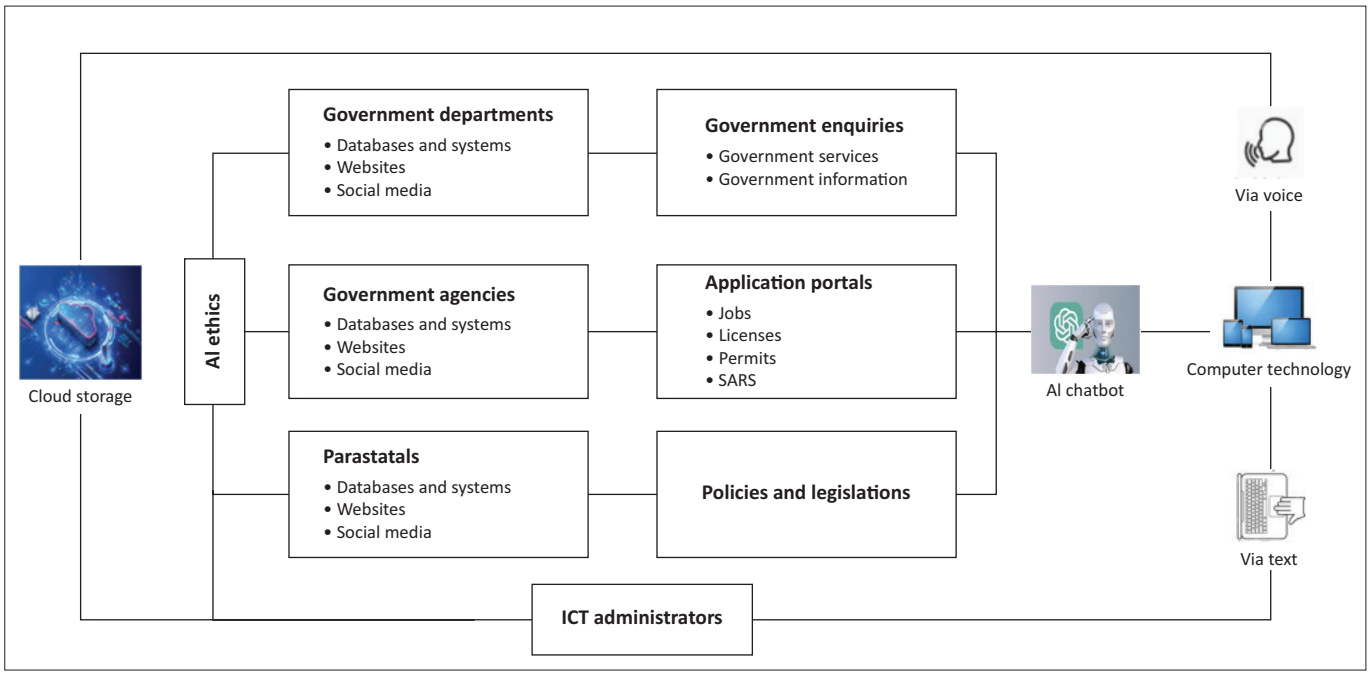
Citizens can avail themselves of a plethora of government services through AI chatbots, spanning from online job applications to the acquisition of driver's licences, permits, IDs and passports. Moreover, the virtual conduct of interviews, digital signing of contracts and remote job functions, epitomise the versatility and efficiency facilitated by AI-driven systems. However, the efficacy of AI chatbots hinges upon robust high-speed internet connectivity and the utilisation of pertinent AI algorithms such as NLP and machine learning (Fischer et al. 2023). Crucially, safeguarding the security and privacy of citizens' personal data emerges as a paramount concern. Government entities would have a duty to implement stringent measures, including encryption protocols and access controls, to prevent unauthorised access and ensure data integrity. Additionally, equipping government employees with the requisite technical and communication skills is imperative to effectively leverage AI chatbots for service delivery (Mishra et al. 2022).

The integration of AI chatbots promises to bolster citizen engagement, furnish real-time assistance and elevate service delivery standards in the context of Society 5.0. To engender public trust and confidence, governments could be duty-bound to uphold the principles of transparency, accountability, fairness and equity in AI chatbot deployment. Prioritising privacy and data protection safeguards against potential breaches that could compromise citizens' sensitive information should always be ensured. Informed consent from citizens regarding the management of their data through AI chatbots could be essential to uphold ethical standards (Sanders et al. 2023). Harnessing the potential of AI chatbots is instrumental in realising the vision of smart digital government services for Society 5.0. However, successful implementation necessitates a comprehensive strategic plan that is underpinned by robust project management practices. By adopting a forward-thinking approach, governments can navigate the complexities of AI integration and pave the way for a digitally inclusive and responsive governance paradigm (Mishra et al. 2022).

Proposed framework

This study recommends a framework that can be used to implement AI chatbots to support smart digital government for Society 5.0. The AI chatbot has the capability to assist governments by providing quality and integrated government services, as illustrated in Figure 1. The framework is focused on how to implement AI chatbots to support smart digital government for Society 5.0.

This framework revolutionises the way citizens interact with their government, ushering in a new era of efficiency, accessibility and transparency. By harnessing the power of AI chatbots, citizens will be empowered to seamlessly access a myriad of government services and information with unprecedented ease. The versatility of AI chatbots can enable citizens to utilise both text and voice interfaces, catering to diverse needs and abilities. Particularly advantageous is the voice interface, which not only facilitates interactions for individuals with disabilities but also enhances the overall accessibility of government services. Through the AI chatbot, citizens would be able to effortlessly navigate through the complex landscape of government services, from enquiring about general information to applying for jobs advertised by various departments, agencies and parastatals through the general enquiries



AI, artificial intelligence; SARS, South African Revenue Service; ICT, information and communication technology.

FIGURE 1: Framework on the use of artificial intelligence chatbot to support smart digital government for Society 5.0.

portal and application portal embedded on AI chatbots. The entire process, from application to communication with government officials and even contract signing, can be streamlined, and conducted digitally, saving time and resources for both citizens and the government.

Cumbersome tasks, such as applying for licences, and permits, and submitting tax returns, will be simplified through the AI chatbot, eliminating the need for tedious queues and paperwork. Even accessing medical records and interacting with healthcare providers will be more convenient, ensuring continuity of care, regardless of geographical location. Crucially, the AI chatbot will serve as a gateway to government policies and legislation, providing citizens with comprehensive access to vital information. Its capability to interpret, summarise and translate policies into multiple languages, will ensure inclusivity and comprehension among all citizens. To uphold the integrity and ethical use of AI chatbots, transparency and informed consent will be paramount. Government entities will be compelled to be forthcoming about the functions and capabilities of the AI chatbot, to allow citizens to make informed decisions about its utilisation. Likewise, citizens will be expected to use the AI chatbot responsibly, by refraining from abusive behaviours that undermine the efficacy of the AI chatbot and compromise government systems.

Technical infrastructure will need to be robustly maintained, to ensure the reliability and security of the AI chatbot. The ICT departments would have to be tasked with implementing stringent cybersecurity measures, to safeguard the system against unauthorised access, viruses and potential breaches. Cloud embedding facilitates ubiquitous access to the AI chatbot, which would enable citizens to seek assistance, at any time and from anywhere. The integration of AI chatbots within government systems would represent a transformative leap towards a more efficient, accessible and citizen-centric governance model. By leveraging cutting-edge technology, governments can better serve their constituents and foster a more inclusive and responsive society.

Conclusion

The study established the fact that the integration of AI chatbots into the framework of smart digital government services for Society 5.0 is believed to have a transformative leap towards enhancing accessibility and efficiency in citizen–government interactions. The utilisation of AI chatbots will enable seamless access to a myriad of government services and information, transcending the barriers of time and location. By leveraging AI chatbots, citizens would be able to effortlessly tap into the vast reservoir of governmental systems, agencies and databases, empowering them to avail themselves of essential services with unprecedented ease. Whether it is contacting emergency departments, accessing medical records, applying for permits and licences or managing tax affairs, citizens would have the capacity to navigate these processes digitally, without the need for physical visits to government offices.

Furthermore, the ubiquitous accessibility afforded by AI chatbots will ensure that citizens can engage with government services, at any time and from anywhere. This level of convenience will not only streamline administrative processes but also foster a more inclusive and responsive governance model. However, amid these advancements, safeguarding the privacy and confidentiality of government information will be paramount. Governments would have to implement robust cybersecurity measures to mitigate the

risks of hacking and unauthorised access, thereby ensuring the integrity and security of citizen data. Considering these factors, the adoption of AI chatbots holds immense potential for enhancing the effectiveness and efficiency of government services. By embracing this technology, governments can uphold their commitment to serve citizens in a more responsive, transparent and accessible manner; ultimately, advancing the principles of Society 5.0. As such, it is imperative for governments to proactively explore and invest in the integration of AI chatbots as a cornerstone of smart digital government initiatives.

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Authors' contributions

M.S. conceptualised the study, wrote the article, conducted literature review and collected data. M.M. edited the article.

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Data availability

The data that support the findings of this article are available from the corresponding author, M.S. upon reasonable request.

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