



International Journal of Electronic Governance

ISSN online: 1742-7517 - ISSN print: 1742-7509

<https://www.inderscience.com/ijeg>

Adoption level of AI conversational systems by governments in Nigeria towards reducing inequality to information access

Oyelami M. Olufemi, Oluwagbemi O. Olugbenga, Falana O. Thomas, Olugbemiga Solomon Popoola, Erinfoami S. Oluwaseyi, Adeyemo Adetoye, Oyebade I. Adedoyin, Olanloye D. Odunayo, Umezuruike Chinecheremm, Oluwadamilare E. Busolami, Atanda G. Oladayo, Adewuyi J. Adeyanju

DOI: [10.1504/IJEG.2025.10070037](https://doi.org/10.1504/IJEG.2025.10070037)

Article History:

Received:	24 August 2024
Last revised:	10 September 2024
Accepted:	20 January 2025
Published online:	18 April 2025

Adoption level of AI conversational systems by governments in Nigeria towards reducing inequality to information access

Oyelami M. Olufemi*

Computer Science Programme,
Bowen University,
Iwo, 232102, Nigeria
Email: olufemi.oyelami@bowen.edu.ng

*Corresponding author

Oluwagbemi O. Olugbenga

Department of Computer Science,
Faculty of Science and Technology,
Middlesex University,
The Burroughs, Hendon, NW4 4BT, London, UK
Email: o.oluwagbemi@mdx.ac.uk

Falana O. Thomas,
Olugbemiga Solomon Popoola,
Erinfolami S. Oluwaseyi, Adeyemo Adetoye,
Oyebade I. Adedoyin, Olanloye D. Odunayo,
Umezuruike Chinecheremm,
Oluwadamilare E. Busolami,
Atanda G. Oladayo and Adewuyi J. Adeyanju

Computer Science Programme,
Bowen University,
Iwo, 232102, Nigeria
Email: odunayo.falana@bowen.edu.ng
Email: olugbemigasolomon.popoola@bowen.edu.ng
Email: oluwaseyi.erinfolami@bowen.edu.ng
Email: adetoye.adeyemo@bowen.edu.ng
Email: adedoyin.oyebade@bowen.edu.ng
Email: odun.olanloye@bowen.edu.ng
Email: chinecherem.umezuruike@bowen.edu.ng
Email: busolami.oluwadamilare@bowen.edu.ng
Email: oladayo.atanda@bowen.edu.ng
Email: joel.adewuyi@bowen.edu.ng

Abstract: Access to relevant information is very crucial to reducing inequality and artificial intelligence (AI) conversational systems are among the technologies that can be used in bridging the digital divide common in developing nations. Chatbots, which are a form of conversational systems have been used in the provision of various forms of services in many nations, but their usage in the provision of services rendered by the government is limited and sometimes, non-existent. This paper investigated the adoption level of this technology by the different levels of government in Nigeria. The official websites of the various governments were searched for text and speech-controlled AI conversational systems. The results revealed that AI chatting systems are not generally available. Consequently, towards attaining SDG goal 10, the adoption of AI chat systems by governments at all levels is of paramount importance to reach the underserved and the unreachable for service access.

Keywords: AI conversational systems; inequality; SDG 10; chatbots; information access.

Reference to this paper should be made as follows: Olufemi, O.M., Olugbenga, O.O., Thomas, F.O., Popoola, O.S., Oluwaseyi, E.S., Adetoye, A., Adedoyin, O.I., Odunayo, O.D., Chinecherem, U., Busolami, O.E., Oladayo, A.G. and Adeyanju, A.J. (2025) 'Adoption level of AI conversational systems by governments in Nigeria towards reducing inequality to information access', *Int. J. Electronic Governance*, Vol. 17, No. 1, pp.4–24.

Biographical notes: Oyelami M. Olufemi, PhD in Computer Science, is a Professor of Computer Science in the Computer Science Programme of Bowen University, Iwo, Nigeria. He is also the current Provost of College of Computing and Communication Studies in the University. His research interests intersect conversational systems, eGovernment, algorithms development and mobile computing.

Oluwagbemi O. Olugbenga is a Computer Scientist obtained a Bachelor's, Master's and PhD degrees in Computer Science, with a 4-year Postdoctoral research experience in Stellenbosch University and the University of Oxford. He is a UKSL (Associate Professor equivalent) of Computer Science, in the Department of Computer Science, Middlesex University London, UK. He is also a Research Fellow in the Department of Computer Science, University of the Western Cape, South Africa. His research interests are applied AI and ML, AI in health, health informatics, computational modelling and bioinformatics.

Falana O. Thomas holds a Bachelor's and a Master's degree in Computer Science from The Federal University of Technology, Akure, Nigeria and currently pursuing a PhD degree in Computer Science in the same university. He is presently working as an Assistant Lecturer in the Department of Information Technology at Bowen University, Iwo, Nigeria.

Olugbemiga Solomon Popoola holds a Bachelor of Technology in Computer Science, a Master of Technology in Computer Science with specialisation in Cyber Security and a PhD in Computer Science with specialisation in Cyber Security. He reviews for journals and he is on the editorial board of a journal. He has chaired a conference session. He has also served as a university external examiner. He has publications in form of books, book chapters, conference papers and journal papers. He is an Assistant Professor and Head of the Cyber Security Programme at Bowen University, Iwo, Nigeria.

Erinfolami S. Oluwaseyi holds a Bachelor's degree in Computer Science from Redeemer's University, Ede and also a Master's degree in Computer Science from Afe Babalola University, Ado-Ekiti. He is skilful in website design and mobile applications development. His research area interests cover health informatics and natural language processing. Presently, he is an Assistant Lecturer in the Department of Computer Science at Bowen University, Iwo, Nigeria.

Adeyemo Adetoye is a Computer Engineer with a Master's degree in Telecommunications and Information System. He is an Assistant Lecturer in the Cyber Security Programme at Bowen University, Iwo, Osun State, Nigeria. He is an experienced lecturer and facilitator with a strong background in Computer Science, Artificial Intelligence, and Cyber Security. He has contributed to various publications in AI, Machine Learning, Cyber Security and Digital Systems.

Oyebade I. Adedoyin is a Computer Scientist. His research interests are in data communication, data science, server administration, database administration, bioinformatics and image recognition. He holds a Master's degree in Computer Science and he is currently, a Doctoral student in Computer Science. He is also an Assistant Lecturer in the Department of Computer Science, Bowen University, Iwo Nigeria.

Olanloye D. Odunayo holds a first degree in Mathematical Sciences with option in Computer Science, a Postgraduate Diploma in Computer Science, a Master's and a Doctorate degree in Computer Science and a Postgraduate Diploma in Education. He is an Assistant Professor in the Department of Computer Science, Bowen University, Iwo, Nigeria.

Umezuruike Chinecheremm holds a PhD in Computer Science. His research interests intersect artificial intelligence (AI) and its applications in health informatics, agricultural technology and weather forecasting. Committed to leveraging advanced computational methods, he aims to enhance decision-making in health outcomes and agricultural productivity. His research explores the integration of AI with the Internet of Things (IoT) to improve health systems and farming practices. With numerous academic contributions and collaborative projects, he seeks to bridge the gap between technology and practical application. He also engages in community outreach to promote digital literacy and advocate for technology for societal progress.

Oluwadamilare E. Busolami is a Computer Scientist/Researcher with a Master's degree in Computer Science and a Doctoral student in Computer Science. She is an Assistant Lecturer in the Computer Science Programme at Bowen University, Iwo, Nigeria.

Atanda G. Oladayo holds a BTech in Computer Engineering, an MTech in Computer Science and a PhD in Computer Science. He is a Lecturer I in the Cyber Security Programme of the College of Computing and Communication Studies, Bowen University, Iwo, Nigeria. His research interests include cyber security, biometrics, artificial intelligence, cryptography, and machine learning.

Adewuyi J. Adeyanju holds a Bachelor's and a Master's degree in Computer Science from the Federal University of Technology, Akure, Nigeria. He is a certified Data Analyst. His research interests include machine learning, computer vision and deep learning. He is an Assistant Lecturer in the Department of Computer Science at Bowen University, Iwo, Nigeria.

This paper is a revised and expanded version of a paper entitled 'A determination of the level of adoption of e-government-based conversational systems in Nigeria' presented at *7th International Conference on E-Commerce, E-Business and E-Government (ICEEG 2023)*, University of Plymouth, Plymouth, UK, 27–29 April, 2023.

1 Introduction

In a 2015 summit, United Nations (UN) brought up the agenda for 2030. This agenda consists of 17 Sustainable Development goals. Goal 10 seeks to reduce inequality and the summit advised countries to ensure that there was a full participation of the entire citizenry in development programs and ensure citizens' capacities for access to information and timely utilisation of information. Information and communication technologies (ICTs) have, however, been identified to be the main driving force of Sustainable Development (Ifijeh et al., 2016).

ICTs have had positive impacts on the lives of the citizenry as well as on the nations and this trend continues as they are changing the way we live. Governments activities are not excluded in ICT usage as eGovernment is continually being implemented by different governments consequent upon its positive impact. Some of the positive impacts include cost effectiveness, provision of improved services to the people, efficiency and effectiveness in the public sector service delivery (Alshehri and Drew, 2010). From the outset, ICT has changed the way the citizenry relates with their various governments (Roztocki et al., 2019).

Mobile Computing forms an important component and contributor to eGovernment (Basu, 2004). It is generally used to refer to any technology people can use to access any service that is network-based, ubiquitously. It provides access to applications remotely and to standalone applications via wireless networks such as Wireless-Packet Data networks, Bluetooth, Wireless Local Area Networks, Infrared-based networks, with the use of handheld phones and devices, small size and portable computers and devices that are wearable.

Conversational-based systems are among systems that can be accessed using mobile phones and other computing devices. They could be speech user interface-based, text user interface-based or chatbots and they allow humans to interact with them via speech or text (Baez et al., 2021). They are referred to as spoken dialogue systems when they are in speech form. Oyelami (2019) has shown that they are effective at reducing digital gaps prevalent in developing countries of the world. This is premised on the fact that with the use of feature phones that are usually of low cost, they can be accessed. The low literate Nigerians usually possess this kind of phone. The implication of this is that it provides a readily available means to reach many Nigerians for services. This assertion is further proved from the statistics given by the National Population Commission, National Bureaus of Statistics and United Nations Children's Fund that from 218 million Nigerian population (National Population Commission, 2022), 196 million of them have a cellular phone (National Bureau of Statistics (NBS) and United Nations Children's Fund (UNICEF), 2021).

Conversational-based systems have been applied in the development of malaria and Ebola health informatics tools (Oluwagbemi et al., 2016a, 2017). They also find

applications in other different health informatics tools that are very significant in managing hereditary and genetic diseases (Oluwagbemi et al., 2016b). Other crucial applications of conversational health informatics tools include HIV management (Oluwagbemi and Jatto, 2019; Oluwagbemi et al., 2020). Some conversational systems are useful at conducting biomedical research, and improving health outcomes (Ogeh et al., 2016). In more recent times, applications are incorporating conversational-based interfaces as part of their features towards increasing their acceptability and enhancing the experiences of their users (Celino and Calegari, 2020). Some of these applications include websites, among others. Different kinds of services have been provided by chatbots; however, government-based ones are difficult to come by Krishna et al. (2022). The few ones that are government-based are text-controlled. Speech-controlled ones and literature on them are few (Baldauf and Zimmermann, 2020). Considering the prospects of bridging the digital divide with this technology in the developing nations, it is of paramount importance that we study its level of adoption in Nigeria, especially by the different levels of government. The findings will assist all stakeholders in decision making towards appropriating the benefits it brings. However, the first online presence that most governments usually have is websites. We provide in this work, the adoption level of text-controlled and speech-controlled chatbots in addition to official websites availability by the governments in Nigeria at both the local and state levels. The authors are unaware of any previous contribution on this issue.

2 Materials and methods

2.1 Sustainable development Goal 10 – reduction of inequality

Inequality involves lopsided distribution of resources and opportunities within a population in a particular time or over a period (Metu and Kalu, 2019). Sustainable Development Goal 10 (SDG10) addresses the issue of inequality in different areas including political and social inclusiveness, economic inclusiveness, growth in income, outcome equality, social protection, inclusiveness of the developing countries in decision making, responsible, orderly regular and safe migration and global financial markets regulation (United Nations, 2015). SDG10 has been identified as an SDG that has no institution both at the national and international levels to monitor its implementation (Saiz and Donald, 2017). Consequently, there is therefore a need for individual efforts to bridge this gap. This work is a contribution in this direction and it focuses on inclusivity (political and social).

Three types of inequality have been identified (MacNaughton, 2017):

- i *Horizontal inequalities*: These refer to the kinds of inequalities between ethnic, social, linguistic, and other population groups. This inequality is also based on the religion, race, gender, sexuality, and background of an individual (Balakrishnan and Heintz, 2015).
- ii *Vertical inequalities*: These are inequalities because of wealth disparity and inequalities in political authority, education, health, and housing.
- iii Inequalities among countries in terms of imbalance of power through organisations like the International Monetary Fund (IMF), the World Bank and the World Trade Organization (WTO). Also included here are inequalities in wealth and income.

2.1.1 Effects of inequality

As stated and presented in Chancel et al. (2018), the following are the effects/problems of inequality:

- i *Health problem*: In the developed countries, there exists a strong correlation between cases of health and social problems and inequality. The issue is that if the problem is that prevalent in the developed world, it is going to be worse in the developing world.
- ii *Economic problem*: Inequality has also been identified to significantly and negatively impacted the economic growth of countries with big economies. It can be inferred obviously that more of the negative impact will be in the developing economies.
- iii *Political problem*: Inequality leads to political instability in the sense that the wealthy people have influence on the laws of nations to their advantage and to the detriment of the poor masses, using the United States as an example. Another resultant effect of inequality is that the rich tend to favour a political party while the common people tend also to favour others leading to polarisation.
- iv *Environmental problem*: Inequality has also been observed to make citizens socially stratify themselves, and policies on the environment are made difficult to be agreed upon and implemented because of inequality.

According to Gilbert (2007):

- v Inequality prevents the poor from progressing and blocks opportunities for others.
- vi It hampers the political process and weakens democracy as the poor are not able to achieve their political ambitions because they lack the financial resource to prosecute them.
- vii Social cohesion is also weakened in that inequality engenders social stratification of the society because of the big gap between the poor and the rich.
- viii Political involvement inequalities affect policy decisions, manifestos and determine those to exercise authority to govern (Leighley, 1992; Lijphart, 1997) as cited in Reeves and Mackenbach (2019).

Also, according to Carpentier et al. (2014):

- ix Inequalities threaten political and social stability.
- x Sustained growth is negatively affected.

According to Ostry and Berg (2011):

- xi Inequality slows down countries' duration of growth in economy.
- xii It leads to increase in corruption.
- xiii Foreign investments are reduced.
- xiv Leads to increase in external debts.
- xv Elimination of extreme poverty, boosting of decent work structures and transformation of economic structures are jeopardised by inequalities.

2.2 *Inequalities in Nigeria*

The work by Ogbeide and Agu (2015) revealed that unemployment causes income inequality in Nigeria while a bidirectional causality relationship exists between inequality and poverty. According to Metu and Kalu (2019), there is no agreed upon definition of poverty, however, they opine that it is always measured in terms of monetary income, meaning that a poor person is unable to acquire what he needs. According to UNDP, poverty is not measured in terms of income, but also in deprivation form and one of the indicators of poverty in deprivation form is lack of access to both private and public resources (Metu and Kalu, 2019). Considering the findings by Ogbeide and Agu (2015), it can be inferred that poverty will prevent the citizens from possessing computers (in form of laptops, desktops, and smart phones) to access information from governments' websites leading to political and social exclusion. However, since most of the populace have access to telephones including less expensive feature phones, the usage of conversational systems, especially spoken dialogue systems, can address the problem of inequality in access to information.

2.3 *Achieving the goals of sustainable development through transformations*

In a bid to achieve SDG goals, six transformational pillars that support the achievement are presented by Sachs et al. (2019) and they are:

- i Gender, education and inequality.
- ii Demography, health and wellbeing.
- iii Sustainability of industry and decarbonisation of energy.
- iv Water, oceans, food and land sustainability.
- v Sustainability of communities and cities.
- vi Sustainable development engendered by digital revolution.

Of particular concern to this work is the sixth transformation which states that to achieve the SDG, digital revolution is necessary. Sachs et al. (2019) opined that regulations, infrastructure in physical form as well as digital systems are necessary to appropriate the benefits of the digital revolution. Four areas of intervention have been identified by this transformation and they are as follows:

- i Provision of a wide access to broadband of high quality, but at a low cost.
- ii Putting in place measures for the promotion of digital inclusion, privacy protection, universal identity and digital skills. These are further broken down into sub-components among which are the digitisation of government facilities and provision of online universal identity.
- iii The need for nations to digitise healthcare and education, enabling online financial transactions and providing support for public goods.
- iv Strengthening of public institutions to oversee and shape digital innovations.

Sachs et al. (2019) stressed that the sixth transformation needs the government, represented by the ministry of science and technology as well as those in the

telecommunication sector to take the lead in ensuring that digital transformation is used as a veritable tool to reduce inequalities towards achieving the SDG. Taking the lead involves working with all the stakeholders in the private as well as in the public sectors and ensuring that there is public-private partnership.

2.4 eGovernment

eGovernment is replete with diverse definitions and this is dependent on the strategy of implementation employed by individual government (Alshehri and Drew, 2010). According to Haldenwang (2004), it is a coordinated and strategic use of ICT in decision making politically and in public administration. Basu (2004) defined eGovernment to refer to the use of ICTs, capable of transforming relationships with businesses, the citizenry, and the different arms of government. It can also be referred to as the provision of services to business outlets, the citizenry, and other entities using Internet related technologies to conveniently obtain services and information provided by the government (Grönlund and Horan, 2005; Hughes et al., 2006).

Some of the benefits provided by eGovernment include:

- 1 Effectiveness of cost and improved service delivery (Ndou, 2004).

From Seifert and Bonham (2003):

- 2 Increased level of service because of tangible resources saving and reduced time resources.
- 3 The possibility of creating new services, resulting in service quality improvement.

According to (Helbig et al., 2009; Grimsley and Meehan, 2007):

- 4 Improved quality of services, creation of public value, effectiveness in cost, enlargement in participation in politics and increase in the internal processes' effectiveness, leading to better governance.

2.5 Chatbots

A chatbot is an interactive natural simulating system powered by artificial intelligence-based knowledge and conversational modelling (Chung and Park, 2019). Chatbots require little familiarity or none and their usage is easy (Fadhil, 2018). Their being easy to use is advantageous for the elderly ones and people that are not tech-savvy (Fang and Heidi, 2019). They are also called software agents because they can interact with human beings via natural language. They have several application areas in today's world. They are being used for everyday tasks on WhatsApp, Facebook, WeChat and Messenger. They could be text-controlled or speech-controlled (Baez et al., 2021). Initially, chatbots were in scripts form mimicking human and machine conversation (Weizenbaum, 1975). However, these days, they have the capability to analyse user's provided inputs in text form semantically and provide suitable response (Pasikowska et al., 2013).

The adoption of chatbots to provide various kinds of services is increasing and applications are incorporating interaction patterns that are chat-like (Celino and Calegari, 2020). It has been projected that by 2025, the chatbot market will reach \$1.23 billion (A report by Grand View Research and cited in Wang and Siau (2018)). The report attests to the growing popularity, usefulness, and growth of chatbots. This continuing adoption

of chatbots is premised on the fact that they give responses to inquiries by users with little efforts on the part of the users (Brandtzaeg and Følstad, 2017). Chatbots have been successfully applied in sectors like health, education, aviation, retailing and banking (Shanbhag, 2022 in Fang and Heidi (2019)).

Recent applications of chatbots are discussed below:

A service-based conversational application for providing real time responses to requests made by customers that are not responded to and those who are not responded to aptly when they want to obtain customer-related services from organisations via their social platforms is reported by Xu et al. (2017). In a bid to have a smart kitchen, Angara et al. (2017) developed a recipe recommending chatbot. In Gardiner et al. (2017), is reported a conversational system for creating awareness and change in behaviour. An artificial intelligence-controlled chatbot for an enhanced response quality and a much higher engagement of the subjects as opposed to traditional way of conducting survey was developed and reported (Xiao et al., 2019). A chatbot christened “Melody chatbot” for booking appointments with physicians, for obtaining health related information and for asking health-based questions and another christened “Osacar” which can be accessed on Facebook Messenger to obtain health insurance estimates were developed by Chung and Park (2019). Reminder Bot that reminds patients to stick to their treatment regimens was developed by Fang and Heidi (2019). Individuals receive personalised interactions from the bot, and it also encourages and motivates the users towards the achievement of their goals. Carayannopoulos (2017) emphasises that students starting in the university often find it difficult navigating their new environments. They are loaded with information and feel unconnected to their colleagues and lecturers. Therefore, a chatbot to alleviate their problems was developed. A chatbot to halt the extinction that loomed over Yoruba language proverbs was developed by Oyelami et al. (2021). The bot makes it possible to learn Yoruba proverbs and its performance for effective learning was evaluated. The findings revealed that young people found it to be effective for learning.

2.6 *Related work*

There exists a scarcity of literature on Nigerian eGovernment implementations (Olasina, 2011), but the following are relevant:

The prospects and progress towards eGovernment implementation are presented by Ifinedo (2007). Adeyemo (2011) identified that Nigeria had recorded a very good success in telecommunications and ICT. Consequently, using a global perspective, the author reviewed the country’s performance in eGovernment implementation. The author found out that eservices in Nigeria were poor and then highlighted the factors that were responsible for this. Furthermore, solutions for the identified problems were also presented. The tips for implementing eGovernment by other sub-Saharan nations are also presented. A framework for the evaluation of eGovernment-based services in Nigeria that is applicable to other nations in Africa was developed by Ibrahim et al. (2016). Mundy and Musa (2010) conducted a survey among UK and Nigerian citizens towards determining their need for eGovernment-based services. The authors also compared the Federal Capital Territory’s website with 10 belonging to different state governments using the websites of five councils in the UK as the yardsticks. The content of the

websites was among the parameters used for the comparison. The content includes audiovisuals, presence of government-citizens transactions, government-businesses transactions, permits and licenses authorisation requests, reports, official documents, and recent information according to Stoica and Ilas (2009). The results obtained from the comparison showed that Nigerian governments' websites considered had low score. Job vacancies announcements were provided by only 20% of the sites. Web links to the websites of other state ministries were provided by 40% of the sites. It was also reported that some metrics considered were not found in the Nigeria sites considered, whereas the UK councils' websites had most of the metrics. Low electricity supply and poor road network were identified by Dode (2007) to impact eGovernment negatively in Nigeria. The author recommended improvement in electricity supply and high computer literacy as remedies. The factors militating against eGovernment implementation in Nigeria were researched by Oghuvbu et al. (2022). Consequently, they made recommendations for overcoming the problems concluding that for the attainment of transparency, accountability and responsiveness, eGovernments is paramount.

In a bid to solve administrative problems in Nigeria, Onuigbo and Eme (2015) presented the problems, roles, and prospects of administration and eGovernance in the country. Towards providing solutions to the challenges of development occasioned by corruption and lack of transparency in governance in Nigeria, Oni (2016) investigated the positive roles played by eGovernment. It was reported by the author that Nigeria still had a low ranking in eGovernment services provision to the people despite having implemented some eGovernment-based initiatives. It was discovered by the author that the eGovernment initiatives implemented had neither reduced corruption nor improved transparency. The author then suggested a framework for the evaluation of eGovernment services to eradicate corruption.

The closest work to this research is the work by Mundy and Musa (2010), but our work is focused on the analysis of the contents of the websites considered and expanded to include entirety of the state governments' websites (36 states), the Federal Capital Territory's (FCT) website and all the 774 local governments' websites. Mundy and Musa (2010) only considered 10 websites from the FCT and all the geo-political zones.

2.7 Methods

All the 36 state governments' websites including that of the FCT and those of the 774 local governments were carefully searched and checked for the availability of different conversational tools. Specifically, speech-controlled chatbots, text-controlled chatbots and chatbots combining both speech and text capabilities were searched for. In addition, the presence of any other form of facility for chatting was also considered. In identifying the websites of the various state and local governments, the exclusive compliance with the use of ".gov.ng" for domain name according to National Information Technology Development Agency (NITDA) was checked for, in all the websites. NITDA was established in the year 2001 to see to the implementation of the policy on Information Technology and to coordinate the general Information Technology development in the country. The results section provides a comprehensive outlook of the outcome of the search. The percentage of the websites having each chatting facility was computed.

3 Results

Table 1 and Figure 1 contain the results of the chatbots available on the state governments and FCT websites considered on geo-political basis. No website (0%) has speech-enabled chatbot. The same percentage (0%) also applies to chatbots with both speech and text capabilities. Two (5.4%) out of all the websites have text-controlled chatbots. These two chatbots are available on the websites of Delta and Plateau state governments, but they have their respective limitations. Plateau State government's chatbot is limited in the type of queries it can handle. It cannot understand a simple question such as "How are you?". Delta State's chatbot only accepts email addresses and telephone numbers through which the users can be interacted with later. It cannot provide immediate response to users' queries. Only Ogun State government's website (2.7%) has other form of chatting facility. It provides through a link, a number for WhatsApp communication with a live Information Officer. Kogi and Benue States from the North Central states have no websites at all. This also represents 5.4%.

Table 1 Availability of chatting facilities on state governments and FCT websites

<i>S. No.</i>	<i>State name</i>	<i>Official website</i>	<i>Speech-controlled Chatbot</i>	<i>Text-controlled Chatbot</i>	<i>Text and Speech-controlled Chatbot</i>	<i>Others</i>	<i>Geo-political Zone</i>
1	FCT	https://myfctag ov.ng/index.php/	—	—	—	—	North Central
2	Benue State	—	—	—	—	—	North Central
3	Kogi State	—	—	—	—	—	North Central
4	Kwara State	https://kwarastate.gov.ng/	—	—	—	—	North Central
5	Nasarawa State	https://nasarawastate.gov.ng/	—	—	—	—	North Central
6	Niger State	https://nigerstate.gov.ng	—	—	—	—	North Central
7	Plateau State	www.plateaustate.gov.ng	—	√	—	—	North Central
8	Abia State	https://abiastate.gov.ng/	—	—	—	—	South East
9	Anambra State	https://anambraastate.gov.ng/	—	—	—	—	South East
10	Ebonyi	https://ebonyistate.gov.ng /	—	—	—	—	South East
11	Enugu State	https://www.enugustate.gov.ng/	—	—	—	—	South East
12	Imo State	https://www.imostate.gov.ng/	—	—	—	—	South East

Table 1 Availability of chatting facilities on state governments and FCT websites (continued)

S. No.	State name	Official website	Speech-controlled Chatbot	Text-controlled Chatbot	Text and Speech-controlled Chatbot	Others	Geo-political Zone
13	Adamawa State	https://adspc.a d.gov.ng/	—	—	—	—	North East
14	Bauchi State	https://www.b auchistate.gov.ng/	—	—	—	—	North East
15	Borno State	https://bornost ate.gov.ng/	—	—	—	—	North East
16	Gombe State	https://gombes tate.gov.ng /	—	—	—	—	North East
17	Taraba State	https://www.tarabastate.g ov.ng/	—	—	—	—	North East
18	Yobe State	https://yobestat e.gov.ng/	—	—	—	—	North East
19	Akwa Ibom State	https://akwaib omstate.go v.ng/	—	—	—	—	South South
20	Bayelsa State	https://joomlag ov.info/db/ africa/niger ia/bayelsastateofficialwebsite	—	—	—	—	South South
21	Cross River State	https://crossriverstate.gov. ng/	—	—	—	—	South South
22	Delta State	https://www.d eltastate.gov.ng/	—	√	—	—	South South
23	Edo State	https://edostate.gov.ng/	—	—	—	—	South South
24	Rivers State	www.riversstat e.gov.ng	—	—	—	—	South South
25	Jigawa State	www.jigawast ate.gov.ng	—	—	—	—	North West
26	Kaduna State	https://kdsg.go v.ng/	—	—	—	—	North West
27	Kano State	https://kanostat e.gov.ng/	—	—	—	—	North West
28	Katsina State	https://katsinas tate.gov.ng /	—	—	—	—	North West
29	Kebbi State	www.kebbistat e.gov.ng	—	—	—	—	North West
30	Sokoto State	https://sokotost ate.gov.ng/	—	—	—	—	North West
31	Zamfara State	zamfara.gov.n g	—	—	—	—	North West

Table 1 Availability of chatting facilities on state governments and FCT websites (continued)

<i>S. No.</i>	<i>State name</i>	<i>Official website</i>	<i>Speech-controlled Chatbot</i>	<i>Text-controlled Chatbot</i>	<i>Text and Speech-controlled Chatbot</i>	<i>Others</i>	<i>Geo-political Zone</i>
32	Ekiti State	https://www.ekitistate.gov.ng/	–	–	–	–	South West
33	Lagos State	https://lagosstate.gov.ng/	–	–	–	–	South West
34	Ogun State	https://ogunstate.gov.ng/	–	–	–	✓	South West
35	Ondo State	https://ondostate.gov.ng/	–	–	–	–	South West
36	Osun State	https://www.osunstate.gov.ng/	–	–	–	–	South West
37	Oyo State	https://oyostate.gov.ng/	–	–	–	–	South West
Total			0	2	0	1	
Percentage (%)			0	5	0	3	

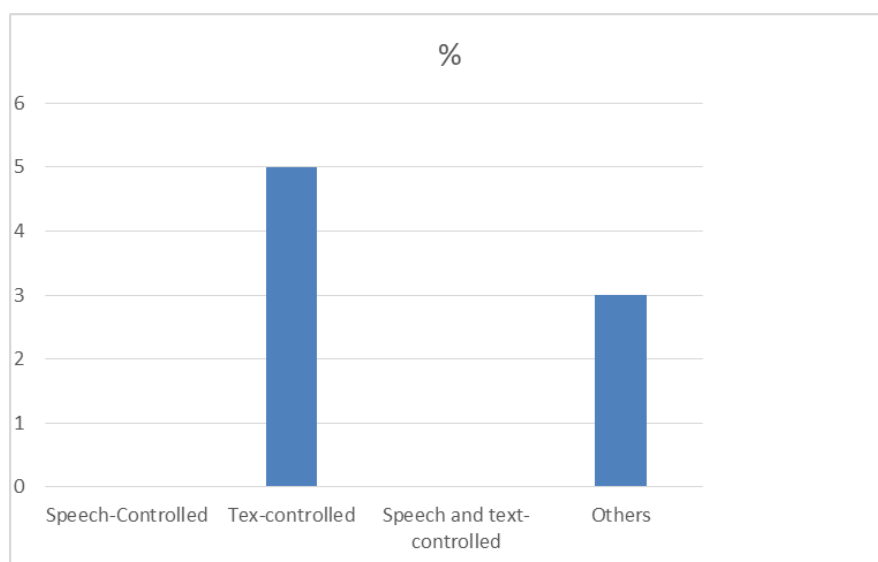
Figure 1 Availability of chatting facilities on state governments websites (see online version for colours)

Table 2 and Figure 2 show the web presence of the various local governments in Nigeria. None has web presence in the central zone of the north, none in the North-East, none in North-West, 22 in the South-East, 9 in the South-South and only 5 in the South-Western zone. This means that only 36 out of the 774 local governments in Nigeria have websites. This represents only 4.7% of the entire local governments in Nigeria.

Table 2 Local governments with web presence

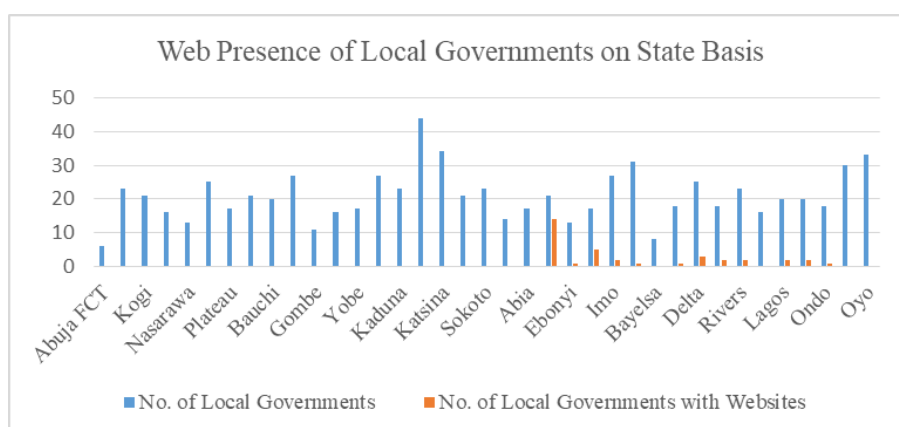
<i>S. No.</i>	<i>State</i>	<i>Zone</i>	<i>No. of local governments</i>	<i>No. of local governments with web presence</i>	<i>Names of local governments with web presence</i>	<i>Local government web address</i>
1	Abuja FCTA	NC	6	Nil	Nil	Nil
2	Benue	NC	23	Nil	Nil	Nil
3	Kogi	NC	21	Nil	Nil	Nil
4	Kwara	NC	16	Nil	Nil	Nil
5	Nasarawa	NC	13	Nil	Nil	Nil
6	Niger	NC	25	Nil	Nil	Nil
7	Plateau	NC	17	Nil	Nil	Nil
8	Adamawa	NE	21	Nil	Nil	Nil
9	Bauchi	NE	20	Nil	Nil	Nil
10	Borno	NE	27	Nil	Nil	Nil
11	Gombe	NE	11	Nil	Nil	Nil
12	Taraba	NE	16	Nil	Nil	Nil
13	Yobe	NE	17	Nil	Nil	Nil
14	Jigawa	NW	27	Nil	Nil	Nil
15	Kaduna	NW	23	Nil	Nil	Nil
16	Kano	NW	44	Nil	Nil	Nil
17	Katsina	NW	34	Nil	Nil	Nil
18	Kebbi	NW	21	Nil	Nil	Nil
19	Sokoto	NW	23	Nil	Nil	Nil
20	Zamfara	NW	14	Nil	Nil	Nil
21	Abia	SE	17	Nil	Nil	Nil
22	Anambra	SE	21	14	Anaocha (Neni) Anambra East (Otuocha) Awka South (Awka) Anambra West (Nzam) Ayamelum (Anaku) Dunukofia (Ukpo) Ekwusigo (Ozubulu) Ihiala (Ihiala) Idemili South (Ojoto)	https://anaocha.an.gov.ng/ https://www.anambraeastlga.com.ng/ https://awkasouth.an.gov.ng/ https://anambrawest.an.gov.ng/ https://ayamelum.an.gov.ng/home https://dunukofia.an.gov.ng/ https://ekwusigolga.com/ https://ihiala.org/ https://www.idemilisouthlga.com.ng/

Table 2 Local governments with web presence (continued)

<i>S. No.</i>	<i>State</i>	<i>Zone</i>	<i>No. of local governments</i>	<i>No. of local governments with web presence</i>	<i>Names of local governments with web presence</i>	<i>Local government web address</i>
22					Nnewi North (Nnewi)	https://nnewinorth.an.gov.ng/
					Nnewi South (Ukpor)	https://nnewisouth.an.gov.ng/
					Ogbaru (Atani)	https://ogbaru.an.gov.ng/
					Onitsha North (Onitsha)	https://onitshanorth.an.gov.ng/
					Oyi (Nteje)	https://oyi.an.gov.ng/
23	Ebonyi	SE	13	1	Ikwo (Onuebonyi Echara)	https://ikwolocalgovernment.com/
24	Enugu	SE	17	5	Aninri (Ndeaboh)	https://aninrilga.com.ng/
24					Igbo-Etiti (Ogbede)	https://igboetitilga.en.gov.ng/
					Nkanu East (Amagunze)	https://www.nkanueastlga.site/
					Nsukka (Nsukka)	https://nsukkalga.en.gov.ng/
					Uzo-Uwani (Umulona)	https://www.uzo-uwanilga.com.ng/
25	Imo	SE	27	2	Ikeduru (Ihuo)	http://ikeduruunion.org/
					Isu (Umundugba)	http://www.isu.gov.ng/
26	Akwa Ibom	SS	31	1	Mkpat Enin (Mkpat Enin)	http://mkpatenin.ak.gov.ng
27	Bayelsa	SS	8	Nil	Nil	Nil
28	Cross River	SS	18	1	Abi (Itigidi)	https://abilga.cr.gov.ng/
29	Delta	SS	25	3	Ethiope West (Oghara-Town)	https://www.ethiopewestlga.ng/
					Oshimili South (Asaba)	https://www.oslgc.dl.gov.ng/
					Warri South (Warri)	https://warrisouth.dl.gov.ng/
30	Edo	SS	18	2	Orhionmwon (Abudu)	https://www.orhionmwonlga.ed.gov.ng/
					Etsako Central (Fugar)	https://etsakocentrallga.com/

Table 2 Local governments with web presence (continued)

S. No.	State	Zone	No. of local governments	No. of local governments with web presence	Names of local governments with web presence	Local government web address
31	Rivers	SS	23	2	Port Harcourt (Port Harcourt City) Andoni (Ngo Town)	https://phlg.com.ng/ https://andonilga.com/
32	Ekiti	SW	16	Nil	Nil	Nil
33	Lagos	SW	20	2	Ikeja Ibeju Lekki	https://ikeja.lg.gov.ng/ https://ibejulekki.lg.gov.ng/
34	Ogun	SW	20	2	Obafemi-Owode Ado-Odo/Ota	https://obafemiowode.localgov.org/ https://adoodootalg.org.ng/
35	Ondo	SW	18	1	Ondo West	https://www.ondowestlga.on.gov.ng/
36	Osun	SW	30	Nil	Nil	Nil
37	Oyo	SW	33	Nil	Nil	Nil

Figure 2 Web presence of local governments on state basis (see online version for colours)

4 Discussion

The results obtained from this study clearly indicate that there is an urgent need for governments at all levels to take advantage of the benefits provided by conversational systems to reach most of the populace for government services and information access. The speech-controlled chatbots especially will provide a means to reach those who are not computer literate, but can effectively use cellular phones. It will also bring governance closer to the people at the grassroots and serve as a means of narrowing the existing digital gap. It is also important that the adoption of text-controlled chatbots is

also encouraged so that those who are literate can have an alternative means of transacting with the government. In addition, it is commendable that many of the state governments in all the zones have official websites except for two in the North-Central zone. Consequently, the North-Central zone needs to make efforts to draw level with the other zones. It is also important that the various governments consider expanding the scope of the services they provide on their different official websites to eliminate physical contact with corrupt government staffers who would always want to take undue advantage to extort the populace. Also, it is recommended that the official websites should be made available in the native languages in each state too so that the less literate citizens can also have access to government information and services through their native languages.

As for the web presence of local governments, only 36 (4.65%) out of 774 local governments in Nigeria have websites. Considering the results on the geo-political basis, 22 out of 95 local governments in the Southeastern region of the country have web presence and this represents 23.16%. This is followed by 9 local governments out of 123 in the South-South region having websites and this corresponds to 7.32%. Lastly, 5 out of 137 local governments in the Southwestern part have web presence. This represents 3.65%. All the local governments in the three geopolitical zones in the northern part of the country have no web presence. It looks like the following local governments in Table 3 have web presence, but a closer look at them shows that the websites are not official. They belong to organisations of indigenes in diaspora doing one thing or the other for their people or indigenes trying to promote their local governments:

Table 3 Local governments with unofficial web presence

<i>S. No.</i>	<i>Name of local government</i>	<i>State</i>	<i>Geo-political zone</i>	<i>Website</i>
1	Girei Local Government	Adamawa	Northeast	https://5d31ac7700858.site123.me/
2	Ibesikpo Asutan (Nung-Udoe)	Akwa Ibom	South-South	https://ibesikpo-asutan.org/ibesikpo-austannigeria/
3	Nsit Atai (Odot)	Akwa Ibom	South-South	https://nsitatai.org/nsit-atai-inbrief

With this situation, there is no way inequality in access to information can be reduced. Consequently, the various stakeholders need to declare an emergency action on this.

5 Conclusion

This paper has reiterated the fact that access to information is crucial for the attainment of SDG Goal 10 and that conversational systems can be used to provide a widespread access to information in Nigeria as they have good prospects of being usable to narrow the digital gap prevalent in the developing countries to which Nigeria belongs. In addition, these systems have found applicability in different spheres of life, but their application in governance to connect with the citizens is very limited. Consequently, the adoption level of speech-controlled and text-controlled chatbots by governments at the state level was investigated towards determining to what extent they have been utilised in the provision of access to information towards achieving SDG Goal 10. The authors also investigated

the presence of the different local governments on the web. The findings revealed that conversational systems have not been generally adopted by state governments even though they are useful for narrowing the digital gap. Local governments also are practically not available on the web. Consequently, different state governments therefore need to quickly take steps to automate their services through the provision of conversational systems to reduce inequality to access to information so that SDG Goal 10 could be achieved. These conversational systems could be provided in Nigerian local languages in addition to English language so as for the citizens to make choices that best suit their needs. In addition, local governments also need to, as a matter of urgency, be available on the web so that they can provide meaningful services to the locals.

References

- Adeyemo, A.B. (2011) 'E-government implementation in Nigeria: an assessment of Nigeria's global e-Gov ranking', *Journal of Internet and Information Systems*, Vol. 2, No. 1, pp.11–19.
- Alshehri, M. and Drew, S. (2010) 'E-government fundamentals', *Proceedings of the IADIS International Conference, ICT and Society and Human Beings*, Freiburg, Germany, pp.35–42.
- Angara, P., Jiménez, M., Agarwal, K., Jain, H., Jain, R., Stege, U., Ganti, S. and Müller, H.A. (2017) 'Foodie fooderson: a conversational agent for the smart kitchen', *Proceedings of the 27th Annual International Conference on Computer Science and Software Engineering*, IBM Corp., Markham, Ontario, ON, Canada, pp.247–253.
- Assessing the potential of the Sustainable Development Goals (n.d.), *Global Policy*, Vol. 9, No. 1, pp.5–16.
- Baez, M., Daniel, F. and Casati, F. (2021) 'Chatbot integration in few patterns', *IEEE Internet Computing*, Vol. 25, No. 1, pp.52–59, <https://doi.org/10.1109/MIC.2020.3024605>
- Balakrishnan, R. and Heintz, J. (2015) 'How inequality threatens all rights', *Open Democracy*, 29 October, <https://www.opendemocracy.net/openglobalrights/radhikabalakrishnan-james-heintz/howinequality-threatens-all-human-rights>
- Baldauf, M. and Zimmermann, H. (2020) 'Towards conversational e-government: an experts' perspective on requirements and opportunities of voice-based citizen services', *HCI in Business, Government and Organizations HCII Lecture Notes in Computer Science*, Vol. 12204, pp.1–12, Springer, https://doi.org/10.1007/978-3-030-50341-3_1
- Basu, S. (2004) 'E-government and developing countries: an overview', *International Review of Law Computers and Technology*, Vol. 18, No. 1, pp.109–132, <http://dx.doi.org/10.1080/13600860410001674779>
- Brandtzaeg, P.B. and Følstad, A. (2017) 'Why people use chatbots', *Proceedings of International Conference on Internet Science*, Thessaloniki, Greece, pp.377–392, https://doi.org/10.1007/978-3-31970284-1_30
- Carayannopoulos, S. (2017) 'Using chatbots to aid transition', *Proceedings of ICICTE*, Rhodes, Greece, pp.112–127, <https://doi.org/10.1108/IJILT-10-2017-0097>
- Carpentier, C.L., Kozul-Wright, R. and Passos, F.D. (2014) *Why Addressing Inequality Matters*, <https://www.un.org/en/chronicle/article/goal-10-why-addressing-inequality-matters> (Accessed 7 July, 2024).
- Celino, I. and Calegari, G.R. (2020) 'Submitting surveys via a conversational interface: an evaluation of user acceptance and approach effectiveness', *International Journal of Human-Computer Studies*, Vol. 139, No. 2, pp.1–44, <https://doi.org/10.1016/j.ijhcs.2020.102410>
- Chancel, L., Hough, A. and Voituriez, T. (2018) 'Reducing inequalities within countries: assessing the potential of the sustainable development goals', *Global Policy*, Vol. 9, No. 1, pp.5–16, <https://doi.org/10.1111/1758-5899.12511>

- Chung, K. and Park, R.C. (2019) 'Chatbot-based healthcare service with a knowledge base for cloud computing', *Cluster Computing*, Vol. 22, No. 1, pp.1925–1937, <https://doi.org/10.1007/s10586-018-2334-5>
- Dode, R.O. (2007) 'Prospects of e-government implementation in Nigeria', *Proceedings of the 1st International Conference on Theory and Practice of Electronic Governance*, Macao, China, pp.380–383, <https://doi.org/10.1145/1328057.1328137>
- Fadhil, A. (2018) *A Conversational Interface to Improve Medication Adherence: Towards AI Support in Patient's Treatment*, arXiv preprint arXiv: 1803.09844, pp.1–7.
- Fang, K.Y. and Heidi, B. (2019) 'Health information management: engaging the next generation', *Proceedings of the HIMAA/NCCH 36th National Conference*, Western Sydney Stadium, Parramatta, New South Wales, Australia, pp.51–59.
- Gardiner, P.M., McCue, K., Negash, L.M., Cheng, T., White, L.F., Yinusa-Nyahkoon, L., Jack, B.R. and Bickmore, T.W. (2017) 'Engaging women with an embodied conversational agent to deliver mindfulness and lifestyle recommendations: a feasibility randomized control trial', *Patient Education and Counseling*, Vol. 100, No. 9, pp.1720–1729, <https://doi.org/10.1016/j.pec.2017.04.015>
- Gilbert, A. (2007) 'Inequality and why it matters', *Geography Compass*, Vol. 1, No. 3, pp.422–447, <https://doi.org/10.1111/j.1749-8198.2007.00021.x>
- Grimsley, M. and Meehan, A. (2007) 'E-government information systems: evaluation-led design for public value and client trust', *European Journal of Information Systems*, Vol. 16, No. 2, pp.134–148, <https://doi.org/10.1057/palgrave.ejis.3000674>
- Grönlund, Å. and Horan, T.A. (2005) 'Introducing e-gov: history, definitions and issues', *Communications of the AIS*, Vol. 15, pp.713–729, <https://doi.org/10.17705/1CAIS.01539>
- Haldenwang, C.V. (2004) 'Electronic government (E-government) development', *The European Journal of Development Research*, Vol. 16, No. 2, pp.417–432, <https://doi.org/10.1080/0957881042000220886>
- Helbig, N., Gil-Garcia, R.J. and Ferro, E. (2009) 'Understanding the complexity of electronic government: implications from the digital divide literature', *Government Information Quarterly*, Vol. 26, No. 1, pp.89–97, <https://doi.org/10.1016/j.giq.2008.05.004>
- Hughes, M., Scott, M. and Golden, W. (2006) 'The role of business process redesign in creating e-government in Ireland', *Business Process Management Journal*, Vol. 12, No. 1, pp.76–87, <https://doi.org/10.1108/14637150610643779>
- Ibrahim, R., Hilles, S.M.S., Adam, S.M. and Yafooz, W.M.S. (2016) 'Theoretical framework formation for e-government services evaluation: case study of federal republic of Nigeria', *Indian Journal of Science and Technology*, Vol. 9, No. 37, pp.1–7, <https://doi.org/10.17485/ijst/2016/v9i37/94575>
- Ifijeh, G., Iwu-James, J. and Adebayo, O. (2016) 'Digital inclusion and sustainable development in Nigeria: the role of libraries', *Proceedings of the 3rd International Conference on African Development Issues*, Ota, Nigeria, pp.52–57.
- Ifinedo, P. (2007) 'Moving towards e-government in a developing society: glimpses of the problems, progress, and prospects in Nigeria', in Al-Hakim, L. (Ed.): *Global E-Government: Theory, Applications and Benchmarking*, Idea Group Publishing, pp.159–174, <https://doi.org/10.4018/978-1-59904-027-1.ch009>
- Krishna, N.K., Singh, N.K. and Purani, V.S. (2022) 'A survey on providing customer and public administration based services using AI: chatbot', *Multimedia Tools and Applications*, Vol. 81, pp.22215–22246, <https://doi.org/10.1007/s11042-021-11458-y>
- MacNaughton, G. (2017) 'Vertical inequalities: are the SDGs and human rights up to the challenges?', *International Journal of Human Rights*, Vol. 21, No. 8, pp.1050–1072.
- Metu, A.G. and Kalu, C.U. (2019) 'Problems of poverty and inequality in Nigeria', in Ezenekwe, U.R., Metu, A.G., Nwokoye, E.S. and Maduka, O.L. (Eds.): *Structure and Problems of the Nigerian Economy*, Fab Anieh Nig Ltd., pp.226–251.

- Mundy, D. and Musa, B. (2010) 'Towards a framework for e-government development in Nigeria', *Electronic Journal of E-Government*, Vol. 8, No. 2, pp.148–161.
- National Bureau of Statistics (NBS) and United Nations Children's Fund (UNICEF) (2021) *Multiple Indicator Cluster Survey 2021 Statistical Snapshot Report*, Abuja, Nigeria.
- National Population Commission (2022) *Statistics*, Retrieved September 23, 2022 from <https://nationalpopulation.gov.ng/statistics/>
- Ndou, V. (2004) 'E-government for developing countries: opportunities and challenges', *The Electronic Journal on Information Systems in Developing Countries*, Vol. 18, No. 1, pp.1–24, <https://doi.org/10.1002/j.1681-4835.2004.tb00117.x>
- Ogbeide, E. and Agu, D. (2015) 'Poverty and income inequality in Nigeria: any causality?', *Asian Economic and Financial Review*, Vol. 5, No. 3, pp.439–452, <https://doi.org/10.18488/journal.aefr/2015.5.3/102.3.439.452>
- Ogeh, D., Fatumo, S., Oluwagbemi, O. and Olumide, A.O. (2016) 'Informatics tools supporting biomedical research and healthcare outcomes in Africa: current utilization and strategies to improve access', *European Journal of Scientific Research*, Vol. 138, No. 2, pp.137–151.
- Oghuvbu, E.A., Gberekvie, D.E. and Oni, S.O. (2022) 'E-governance in Nigeria: challenges and prospects', *RUDN Journal of Public Administration*, Vol. 9, No. 2, pp.189–199, <https://doi.org/10.22363/2312-8313-2022-9-2-189-199>
- Olasina, G. (2011) 'A review of e-government services in Nigeria', in Tella, A. and Issa, A.O. (Eds.): *Library and Information Science in Developing Countries: Contemporary Issues*, IGI Global Publishers, USA, pp.213–228, <https://doi.org/10.4018/978-1-61350-335-5.ch015>
- Oluwagbemi, O. and Jatto, A. (2019) 'Implementation of a TCM-based computational health informatics diagnostic tool for sub-saharan African students', *Informatics in Medicine Unlocked*, Vol. 14, pp.43–58.
- Oluwagbemi, O., Oluwagbemi, F. and Abimbola, O. (2016a) 'Ebinformatics: Ebola fuzzy informatics systems on the diagnosis, prediction, and recommendation of appropriate treatments for Ebola Virus Disease (EVD)', *Informatics in Medicine Unlocked*, Vol. 2, pp.12–37.
- Oluwagbemi, O., Oluwagbemi, F. and Ughamadu, C. (2016b) 'Android mobile informatics application for some hereditary diseases and disorders (AMAHd): a complementary framework for medical practitioners and patients', *Informatics in Medicine Unlocked*, Vol. 2, pp.38–69.
- Oluwagbemi, O., Oluwagbemi, F., Jatto, A. and Hui, C. (2020) 'MAVSCOT: a fuzzy logic-based HIV diagnostic system with indigenous multi-lingual interfaces for rural Africa', *PLOS ONE*, Vol. 15, No. 11, p.e0241864.
- Oluwagbemi, O., Oluwagbemi, F. and Fagbore, O. (2017) 'Malavefes: A computational fuzzy voice-enabled anti-malarial drug informatics software for correct dosage prescription of anti-malaria drugs', *Journal of King Saud University – Computer and Information Sciences*, Vol. 30, No. 2, pp.185–197.
- Oni, S. (2016) 'E-government adoption in Nigeria and the journey so far: the end of corruption?', in Saeed, S., Bamarouf, Y., Ramayah, T. and Iqbal, S. (Eds.): *Design Solutions for User-Centric Information Systems*, IGI Global, pp.85–102, <https://www.igi-global.com/gateway/chapter/173965>
- Onuigbo, R.A. and Eme, O. (2015) 'Electronic governance and administration in Nigeria: prospects and challenges', *Arabian Journal of Business and Management Review (OMAN Chapter)*, Vol. 5, No. 3, pp.18–26, <https://doi.org/10.12816/0019110>
- Ostry, J.D. and Berg, A. (2011) *Inequality and Unsustainable Growth: Two Sides of the Same Coin?*, International Monetary Fund Staff Discussion Note SDN/11/08, Retrieved from <https://www.imf.org/external/pubs/ft/sdn/2011/sdn1108.pdf>

- Oyelami, O.M. (2019) 'Spoken dialogue system: its applications in the developing countries and a technology for bridging the digital divide and augmenting scarce services in those countries', *Asian Journal of Research in Computer Science*, Vol. 4, No. 2, pp.1–11, <https://doi.org/10.9734/Ajrcos/2019/v4i230110>
- Oyelami, O.M., Famutimi, F.R. and Fadare, T.S. (2021) 'Development and evaluation of an android-based yoruba language proverbs preservatory and repository system', *International Journal of Computer Applications*, Vol. 183, No. 6, pp.9–15, <https://doi.org/10.5120/ijca2021921228>
- Pasikowska, A., Zaraki, A. and Lazzeri, N. (2013) 'A dialogue with a virtual imaginary interlocutor as a form of psychological support for well-being', *Proceedings of the International Conference on Multimedia, Interaction, Design and Innovation (MIDI '13)*, Warsaw, Poland, pp.1–15, <https://doi.org/10.1145/2500342.2500359>
- Reeves, A. and Mackenbach, J.P. (2019) 'Can inequalities in political participation explain health inequalities?', *Social Science and Medicine*, Vol. 234, p.112371, <https://doi.org/10.1016/j.socscimed.2019.112371>
- Roztocki, N., Soja, P. and Weistroffer, H.R. (2019) 'The role of information and communication technologies in socioeconomic development: towards a multi-dimensional framework', *Information Technology for Development*, Vol. 25, No. 2, pp.171–183, <https://doi.org/10.1080/02681102.2019.1596654>
- Sachs, J.D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N. and Rockström, J. (2019) 'Six transformations to achieve the sustainable development goals', *Nature Sustainability*, Vol. 2, pp.805–814, <https://doi.org/10.1038/s41893-019-0352-9>
- Saiz, I. and Donald, K. (2017) 'Tackling inequality through the sustainable development goals: human rights in practice', *International Journal of Human Rights*, Vol. 21, No. 8, pp.1029–1049.
- Seifert, J.W. and Bonham, M. (2003) 'The transformative potential of e-government in transitional democracies', *Public Management Electronic Journal*, Vol. 2, pp.19–22.
- Shanbhag, A. (2022) *Top Chatbot Use Cases in Different Industries*, Botcore, 25 November, <https://botcore.ai/blog/top-chatbot-use-cases-in-different-industries/>
- Stoica, V. and Ilas, A. (2009) 'Romanian urban e-government: digital services and digital democracy in 165 cities', *Electronic Journal of E-Government*, Vol. 7, No. 2, pp.171–182.
- United Nations (2015) *Statistical Yearbook for Asia and the Pacific*, https://www.unescap.org/sites/default/files/SYB2015_Full_Publication.pdf (Accessed 10 July, 2024).
- Wang, W. and Siau, K. (2018) 'Trust in health chatbots', *Proceedings of the Thirty-Ninth International Conference on Information Systems*, San Francisco, p.1.
- Weizenbaum, J. (1975) *Computer Power and Human Reason*, 1st ed., W. H. Freeman.
- Xiao, Z., Zhou, M.X., Liao, Q.V., Mark, G., Chi, C., Chen, W. and Yang, H. (2019) *Tell Me about Yourself: Using an AI-Powered Chatbot to Conduct Conversational Surveys*, arXiv preprint arXiv: 1905.10700, <https://doi.org/10.48550/arXiv.1905.10700>
- Xu, A., Liu, Z., Guo, Y., Sinha, V. and Akkiraju, R. (2017) 'A new chatbot for customer service on social media', *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17)*, Denver, CO, USA, pp.3506–3510, <https://doi.org/10.1145/3025453.3025496>