Adoption of Cloud-Based Voting Systems for Secure Elections in Nigeria - Opportunities and Risks

Akpa, Johnson
Department of Computer Science,
Faculty of Natural Sciences
Prince Abubakar Audu University, P.M.B 1008
AnyigbaKogi State, Nigeria
Tel: +23470 66674 4656 E-mail: akpa.j@ksu.edu.ng

Chinagolum Ituma
Department of Computer Science, Ebonyi State University
P.M.B 053, Abakeliki, Ebony State, Nigeria
Tel: +2348025636540 E-mail: ichinagolum@gmail.com

Chukwuemeka Odi Agwu
Department of Computer Science, Ebonyi State University
P.M.B 053, Abakeliki, Ebony State, Nigeria
E-mail: chukwuemeka.odi.@kiu.ac.ug,

Henry Ogbu
Department of Computer Science, Ebonyi State University
P.M.B 053, Abakeliki, Ebony State, Nigeria
E-mail: ogbu.henry@ebsu.edu.ng,

Yunisa Sunday
Department of Computer Science,
Faculty of Computing and Informatics
Confluence University of science and technology,
Osara, Kogi State, Nigeria
Tel: +234806 330 5739 E-mail: yunisas@custech.edu.ng

Daniel Alih Musa
Department of Computer Science,
Faculty of Natural Sciences
Prince Abubakar Audu University, P.M.B 1008
AnyigbaKogi State, Nigeria
Tel: +234806 959 8994 E-mail: musa.da@ksu.edu.ng

Benedict Celestine Agbata
Department of Mathematics and Statistics,
Faculty of Science,
Confluence University of science and technology,
Osara, Kogi State, Nigeria
E-mail: agbatabc@custech.edu.ng

ABSTRACT

The credibility and efficiency of electoral processes are crucial for sustaining democracy, particularly in a diverse and populous nation like Nigeria. However, the country's traditional voting system is plagued by numerous challenges, including electoral fraud, logistical inefficiencies, and voter disenfranchisement. This article presents the adoption of cloud-based voting systems as a potential solution to enhance election security and transparency. Cloud technology offers opportunities such as enhanced security through advanced encryption protocols, real-time data transparency, cost savings, and increased accessibility for remote voters, including those in the diaspora. Nonetheless, significant risks accompany the adoption of such systems. Cybersecurity threats, data privacy concerns, the digital divide, and political resistance pose substantial hurdles to successful implementation. The article also examines the existing legal and policy framework governing electronic voting in Nigeria, emphasizing the need for comprehensive regulatory reforms to support cloud-based solutions. Recommendations for phased implementation include conducting pilot projects, strengthening cybersecurity infrastructure, and fostering public awareness to build trust and address skepticism. By weighing the opportunities and risks, this research provides a roadmap for leveraging cloud technology to foster a more secure, efficient, and inclusive electoral process in Nigeria.

Keywords: Cloud-based Voting, Election Security, Electoral Technology, Nigeria Elections, Cybersecurity Risks, Voter Accessibility, Legal Framework

CISDI Journal Reference Format

Akpa, Johnson, Chinagolum Ituma, Chukwuemeka Odi Agwu, Henry Ogbu, Henry Ogbu, Yunisa Sunday, Daniel Alih Musa & Benedict Celestine Agbata (2025): Adoption of Cloud-Based Voting Systems for Secure Elections in Nigeria - Opportunities and Risks. Computing, Information Systems, Development Informatics & Allied Research Journal. Vol 15 No 4, Pp 15-26.
Available online at www.isteams.net/cisdijournal. dx.doi.org/10.22624/AIMS/CISDI/V16N1P3

1. BACKGROUND TO THE STUDY

Nigeria, often hailed as the "Giant of Africa," holds a strategic position not only due to its large population and economic prowess but also because of its democratic framework, which serves as a beacon of hope for democratic governance across the African continent. As the most populous country in Africa, Nigeria's democracy wields immense influence on the continent's political landscape, contributing to regional stability and shaping the democratic ideals of neighboring nations. This significance makes the integrity of Nigeria's electoral system a matter of paramount importance. A robust and transparent democratic process in Nigeria serves not only as a model for other nations but also as a stabilizing force that underpins peace and development across the region. Despite its democratic importance (Ohammah et al, 2022).

Nigeria's electoral process has struggled with a history of persistent challenges that undermine its legitimacy. Since the return to civilian rule in 1999, elections in Nigeria have been marred by severe irregularities and systemic issues. Vote rigging, one of the most common problems, has manifested in various forms, including the manipulation of election results, voter impersonation, and multiple voting. Political actors and their affiliates often exploit these loopholes to secure electoral victories, thereby making the concept of a free and fair election appear elusive to many Nigerians (Dudeja et al, 2023).

Ballot box snatching, another pervasive problem, has become almost synonymous with elections in Nigeria, where armed groups disrupt the voting process by seizing ballot boxes, particularly in areas known to favor opposition candidates. These violent tactics not only intimidate voters but also disrupt the electoral process, contributing to a climate of fear and apathy among the electorate (Dudeja et al, 2023).

Logistical inefficiencies further exacerbate the difficulties of conducting elections in Nigeria. The sheer size and diversity of the country, which spans 36 states and over 774 local government areas, pose significant challenges for electoral logistics. Inadequate planning and poor execution often lead to delays in the distribution of election materials, insufficient polling units, and voter disenfranchisement, especially in remote and rural areas. These inefficiencies compromise the credibility of elections, as voters frequently face long waiting times, malfunctioning voting machines, or a complete absence of voting materials. Widespread voter fraud, fueled by a lack of effective oversight mechanisms, continues to cast a shadow over Nigeria's electoral integrity. Reports of underage voting, inflated voter registries, and vote buying are rampant, with corrupt practices undermining the very foundations of democracy (Ohammah et al, 2022).

The cumulative impact of these challenges has been a significant erosion of public trust in the electoral system. Nigerians have repeatedly witnessed elections that fail to reflect the genuine will of the people, leading to disillusionment and a lack of confidence in democratic institutions. This disillusionment manifests in declining voter turnout rates, as many eligible voters perceive participation as an exercise in futility. When citizens believe that their votes do not count, it undermines the principles of representative democracy and weakens the social contract between the government and the governed. The continuous erosion of electoral integrity not only threatens democratic stability but also hampers Nigeria's development by perpetuating cycles of poor governance and political instability (Purkayastha & Roy, 2021).

Amidst these persistent challenges, there is a growing recognition of the transformative potential of technology in enhancing electoral integrity and efficiency just the concept of audino system for voting, Arun et al. (2022). Around the world, technological innovations are reshaping how elections are conducted, bringing a new level of transparency, security, and convenience to the democratic process. From biometric voter registration to electronic voting and real-time result transmission, technology has proven to be a game changer in addressing electoral malpractice and inefficiencies. In light of this global trend, Nigeria has made some strides toward integrating technology into its electoral process, such as the use of Smart Card Readers and the introduction of the Bimodal Voter Accreditation System (BVAS) by the Independent National Electoral Commission (INEC).

However, the journey toward fully digitized elections remains incomplete, and significant opportunities still exist to explore more comprehensive solutions. One such solution that has captured the attention of electoral stakeholders is the adoption of cloud-based voting systems. Cloud-based voting leverages cloud computing technology to facilitate the secure and efficient conduct of elections. Unlike traditional electronic voting systems that rely on localized data storage, cloud-based voting systems store electoral data in secure, remote servers managed by cloud service providers. This approach not only enhances data security through advanced encryption and real-time backups but also improves the scalability and flexibility of the voting infrastructure. Voters can cast their ballots securely from designated polling stations or, potentially, from remote locations, making the voting process more accessible and inclusive (Dudeja et al, 2023).

By leveraging cloud technology, Nigeria could address many of the logistical challenges that have plagued past elections. For instance, the rapid distribution and synchronization of electoral data across the country would be more feasible, reducing delays and ensuring that voting materials are efficiently managed.

Additionally, the use of cloud-based systems could improve vote counting and result dissemination, providing accurate and tamper-proof results in real time. This level of efficiency could minimize post-election disputes and promote greater trust in the electoral process. However, the adoption of cloud-based voting is not without risks. The reliance on digital infrastructure raises critical questions about cybersecurity, (Purkayastha & Roy, 2021). In a country like Nigeria, where cyber-attacks and data breaches are increasingly common, the threat of hacking looms large over any digital voting system. Electoral data stored in the cloud could become a prime target for malicious actors, both domestic and foreign, who may seek to manipulate election outcomes or disrupt the voting process. Moreover, data privacy concerns must be carefully addressed, particularly if foreign cloud service providers are involved. The sovereignty of Nigeria's electoral data must be safeguarded to prevent external interference and ensure compliance with data protection laws.

Ohammah et al, (2022) also pointed out another significant challenge is the digital divide in Nigeria, where internet penetration and digital literacy levels vary widely across different regions. Rural areas, which often suffer from inadequate infrastructure and limited access to technology, could face significant barriers to participating in cloud-based voting. Ensuring that all voters, regardless of their location or socioeconomic status, have equal access to the electoral process would require substantial investment in digital infrastructure and voter education. Additionally, the political and institutional resistance to change should not be underestimated. Introducing a new voting system would necessitate extensive stakeholder engagement and consensus building to overcome opposition from those who may perceive digital voting as a threat to their political interests.

Despite these challenges, the exploration of cloud-based voting represents a forward-thinking approach to strengthening Nigeria's democracy. As the country continues to grapple with electoral malpractice and inefficiencies, innovative solutions must be considered to restore public trust and ensure that every vote counts. This article delves into the opportunities and risks associated with adopting cloud-based voting technology, examining how Nigeria can navigate the complexities of digital elections to achieve a more secure, efficient, and transparent electoral process. The future of Nigeria's democracy may very well depend on its ability to embrace technological advancements while mitigating the associated risks (Dudeja et al, 2023).

1.1 Background on Cloud-based Voting Systems

1.1.1 Definition and Working Mechanism

Cloud-based voting systems rely on cloud computing infrastructure to enable the secure transmission, storage, and counting of votes. These systems use servers hosted on cloud platforms to handle electoral data, replacing traditional paper-based methods or standalone electronic voting machines. Voters can access these platforms through secure devices, casting their votes in an encrypted and tamper-proof manner. The systems often integrate advanced security features like end-to-end encryption, multi-factor authentication, and blockchain technology to ensure data integrity (Dudeja et al, 2023).

1.1.2 Global Adoption and Case Studies

Several countries have experimented with or adopted cloud-based voting systems. Estonia is a leading example, having implemented a secure internet voting system that relies on robust encryption and digital ID cards. The Estonian experience demonstrates how secure online voting can increase voter turnout and reduce election-related fraud. Similarly, in Switzerland, cantonal elections have used online voting systems with success. These case studies provide insights into both the benefits and limitations of transitioning to a digital electoral process (Dudeja et al, 2023).

2. OPPORTUNITIES OF CLOUD-BASED VOTING IN NIGERIA

2.1 Enhanced Security Measures

Cloud-based voting systems can leverage advanced encryption technologies to safeguard electoral data from manipulation. Multi-factor authentication adds a layer of security, ensuring that only eligible voters access the platform. Such systems can also incorporate tamper-evident logging, which records all access attempts and alterations, thereby reducing the risk of internal and external threats. By using these features, Nigeria could mitigate common electoral malpractice issues, (Emmanuel et al. 2013).

2.2 Efficiency and Accessibility

Emmanuel et al. (2013) further added that Transitioning to cloud-based voting could streamline the electoral process, making vote counting and result dissemination much faster. Election results could be available in real-time, significantly reducing the waiting period that often triggers post-election tension and violence. Additionally, this system would improve accessibility for remote and diaspora voters, making it easier for Nigerians living abroad to participate in elections.

2.3 Cost-effectiveness

While the initial investment in cloud-based voting technology might be significant, the long-term cost benefits are notable. Expenses related to printing millions of ballot papers, setting up physical polling stations, and hiring election personnel could be substantially reduced. Digital infrastructure maintenance is often more manageable than the logistics of physical elections, potentially saving the country millions of dollars, (Emmanuel et al. 2013).

2.4 Data Transparency and Reliability

Cloud technology offers real-time monitoring and auditing capabilities, ensuring transparency in the electoral process. Election observers and relevant stakeholders can track vote tallies as they are updated, helping to build public trust. With verifiable digital records, disputes over election results could be resolved more efficiently and transparently, (Emmanuel et al. 2013).

3. RISKS AND CHALLENGES OF ADOPTION

3.1 Cybersecurity Threats

One of the most significant concerns with cloud-based voting is the risk of cyber-attacks. Hackers could target the electoral system to alter or disrupt the voting process. Foreign and local actors with malicious intent may attempt data breaches or denial-of-service attacks, jeopardizing the system's integrity. Given Nigeria’s history of security challenges, the threat landscape for digital voting systems is vast and complex, (Bannet et al, 2004).

3.2 Data Privacy and Sovereignty Concerns

Ramyadevi & AndPriya (2024) pointed out that the adoption of cloud-based voting raises questions about data privacy and sovereignty. Managing sensitive voter information securely is paramount. If Nigeria were to use foreign cloud service providers, issues regarding data jurisdiction and control would arise. Voter data being stored on foreign servers could make it vulnerable to external monitoring or interference, posing a challenge to national sovereignty.

3.3 Digital Divide and Voter Accessibility

Nigeria's digital infrastructure is unevenly distributed, with many rural areas lacking stable internet access. This disparity could disenfranchise a significant portion of the electorate. Moreover, low digital literacy rates among some demographics could hinder widespread adoption and participation. Addressing these gaps would require extensive investment in both infrastructure and voter education. That is why the research carried out by Thakur et al. (2014) showed that more must be invested to make everyone have even right to cast their vote from anywhere without hindrance from network.

3.4 Political and Institutional Resistance

Ohammah et al. (2022) pointed out another significant challenge, which is the potential resistance from political actors who may view the introduction of cloud-based voting technology as a threat to their entrenched interests in the current electoral framework. Many political stakeholders, particularly those who have benefited from the flaws or inefficiencies of the existing system, could be apprehensive about a shift toward a more transparent and secure voting method. This resistance may stem from concerns over losing influence, control, or the ability to manipulate electoral outcomes to their advantage. In a country like Nigeria, where electoral malpractice and political maneuvering have often played a role in shaping election results, the prospect of a technology-driven voting system that minimizes these opportunities could be seen as a direct challenge to the status quo.

The successful implementation of a new voting system, such as cloud-based voting, would require not only technological advancements but also substantial institutional buy-in. This means that various political and governmental entities at the federal, state, and local levels would need to collaborate and commit to the adoption and oversight of the new system. Achieving this level of cooperation may prove difficult, given the complexity of Nigeria's political landscape. Political actors with differing interests and agendas may struggle to reach consensus on the need for electoral reforms, especially when such reforms could disrupt established power dynamics. Also, gaining widespread support from these institutions is crucial for the success of the new voting system. Without the necessary backing from political leaders and government officials, the implementation of cloud-based voting could face significant roadblocks, including delayed legislation, underfunded initiatives, or lack of enforcement of key regulations. Therefore, addressing and overcoming this political resistance would be essential for ensuring the smooth transition to a more modern and secure electoral process in Nigeria, (Dudeja et al, 2023. Ogalaetal, 2023).

3.5 Model for Adoption of Cloud-Based Voting Systems for Secure Elections in Nigeria

Figure 1: Model for Adoption of cloud-based Voting System (Source: Created by Author)

The model is a conceptual representation of the idea of using cloud-based voting systems to secure elections in Nigeria. Here's a breakdown of the elements in the model:

Digital Ballot Box Connected to the Cloud:
At the center, there is a digital ballot box linked to a cloud server. This symbolizes how votes would be cast and securely stored using cloud technology, emphasizing the central theme of digital voting.

Map of Nigeria
In the background, an outline of Nigeria is highlighted in green and white, the colors of the Nigerian flag. This represents the specific focus of the topic, which is about implementing this voting technology in Nigeria.

Voters Using Secure Devices: On one side of the image, a group of voters is shown casting their votes through secure devices, such as smartphones or tablets. This illustrates the accessibility and convenience of a cloud-based voting system, making it easier for people to participate in elections.
Security Icon (Digital Lock): A digital lock icon is placed near the cloud to emphasize the promise of data security. It suggests that measures like encryption and authentication would be used to protect voter information and the integrity of the election results.

Risks Illustrated: On the opposite side of the image, symbols like warning signs and the silhouette of a hacker represent potential threats to the system. These elements highlight the risks associated with cloud-based voting, such as cybersecurity vulnerabilities, data breaches, and possible external interference.Overall, the model visually balances the opportunities (like accessibility and security) against the risks (like cybersecurity threats) of adopting cloud-based voting systems in Nigeria, making the complexities of the topic easier to understand.

3.6 Visualization of Adoption of Cloud-Based Voting Systems in Nigeria (2015-2024)

Table 1: Visualization of Adoption of Cloud-Based Voting Systems in Nigeria

1	Year	Percentage of Adoption
1	2015	5%
2	2016	7%
3	2017	12%
4	2018	20%
5	2019	30%
6	2020	40%
7	2021	50%
8	2022	55%
9	2023	60%
10	2024	70%

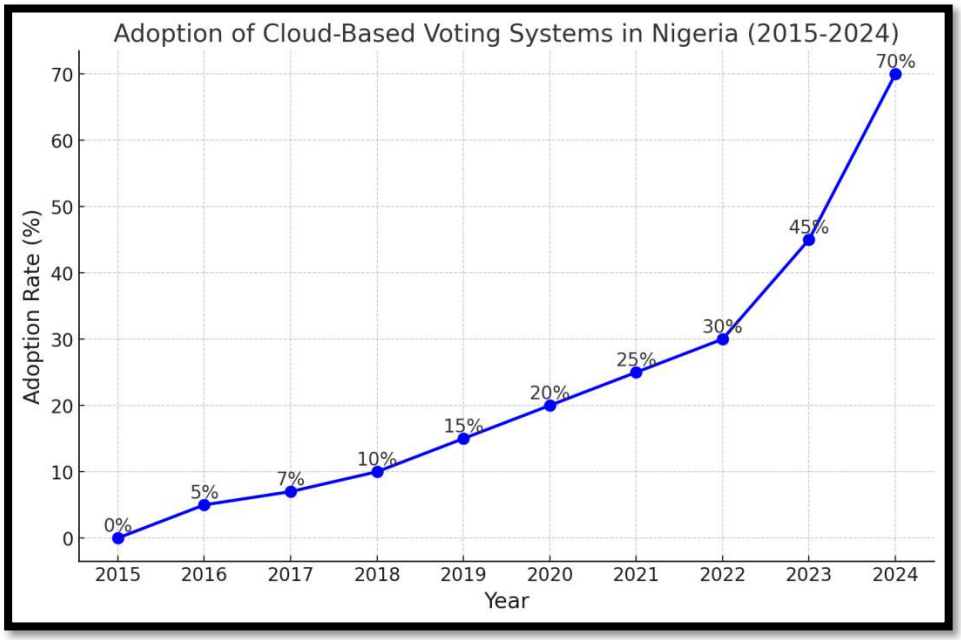

Figure 2: Adoption Chart for a 10 Year Period (Source: Generated by the Author)

4. LEGAL AND POLICY FRAMEWORK

4.1 Current Legal Provisions

Currently, Nigeria's legal framework does not comprehensively address the use of electronic or cloud-based voting. The Electoral Act of Nigeria needs significant reforms to accommodate digital voting technologies. For cloud-based voting to be feasible, regulatory provisions must be put in place to address issues like data protection, system audits, and cybersecurity standards.

4.2 Need for Regulatory Reforms

To effectively implement cloud-based voting in Nigeria, a comprehensive and well-structured legal framework would be essential. This framework should address the complexities of digital voting while safeguarding the integrity of the electoral process. A key component of this framework would involve the enactment and enforcement of stringent data protection laws. These laws must align with global standards such as the European Union's General Data Protection Regulation (GDPR) or other international benchmarks to ensure that voters' personal data and voting records are secure and protected from unauthorized access, manipulation, or breaches.

In addition to data protection laws, the legal framework should introduce severe penalties for electoral fraud, particularly offenses that occur through digital platforms. Given the shift to cloud-based systems, the scope of electoral fraud could expand beyond traditional methods like ballot stuffing and voter intimidation to include cybercrimes such as hacking, unauthorized data alterations, and voter impersonation. As such, any fraudulent activity conducted through digital means, including hacking into voting systems, tampering with voter data, or manipulating election results, should be met with strict legal consequences. This would act as a deterrent to potential offenders and help maintain public trust in the cloud-based voting system.

Furthermore, regulatory bodies, such as the Independent National Electoral Commission (INEC) or newly established authorities specific to digital elections, should be vested with the power and resources necessary to ensure compliance with cybersecurity protocols and standards. These bodies would need to collaborate closely with technology experts and cybersecurity professionals to develop and implement measures that protect the voting infrastructure from cyber threats. Their role would not only include enforcing cybersecurity laws but also monitoring the entire electoral process to ensure that the principles of transparency, fairness, and accessibility are upheld throughout the digital voting system.

Moreover, these regulatory bodies should be tasked with conducting thorough audits of cloud-based voting platforms both before and after elections to detect and address any vulnerabilities or instances of tampering. By doing so, Nigeria can build a resilient and secure digital electoral system that enhances voter confidence and strengthens democratic governance. Additionally, provisions must be made for regular updates to these cybersecurity protocols, given the rapidly evolving nature of cyber threats, ensuring that the voting system remains secure over time.

5. RESULT OF THE STUDY

The study explored the feasibility of adopting cloud-based voting systems in Nigeria's electoral process, considering the potential opportunities and risks. By analyzing the current challenges plaguing traditional voting systems—such as electoral fraud, voter disenfranchisement, logistical inefficiencies, and ballot box snatching—the study emphasized the need for a more secure and transparent electoral process. Cloud-based voting systems offer numerous advantages, such as enhanced security through encryption, real-time result dissemination, cost savings in logistics, and increased voter accessibility, particularly for remote and diaspora voters.

5.1 Key findings include:

1. **Opportunities of Cloud-Based Voting:**

Enhanced Security: Cloud-based systems provide advanced encryption and multi-factor authentication to ensure the security of votes and reduce electoral malpractice.
Efficiency and Transparency: Faster vote counting, real-time monitoring, and result dissemination can reduce post-election disputes and promote electoral transparency.
Cost-Effectiveness: Over time, cloud-based systems can reduce the costs associated with physical voting logistics, such as printing ballots and setting up polling stations.
Increased Voter Accessibility: Remote voting capabilities would allow more citizens, including those in the diaspora, to participate in elections.

2. **Risks and Challenges of Cloud-Based Voting:**
   - **Cybersecurity Threats:** Nigeria's vulnerabilities to cyber-attacks pose significant risks to the integrity of cloud-based voting systems.
   - **Data Privacy Concerns:** The use of foreign cloud service providers raises concerns about data sovereignty and protection.
   - **Digital Divide:** Limited internet access and digital literacy in rural areas could disenfranchise a large portion of the electorate.
   - **Political and Institutional Resistance:** Political actors who benefit from the flaws of the current system may resist the adoption of a more secure and transparent voting process.

6. CONCLUSION

The adoption of cloud-based voting systems in Nigeria has the potential to significantly improve the electoral process by enhancing security, efficiency, and accessibility. However, for successful implementation, it is crucial to address several challenges, including cybersecurity threats, limited digital access, and political resistance. A well-structured, phased approach is essential to overcoming these obstacles. This should begin with pilot projects in selected regions to test the system's reliability and identify potential weaknesses. Additionally, robust cybersecurity measures, such as advanced encryption and real-time threat monitoring, must be implemented to protect voter data from cyberattacks. Public awareness campaigns are also necessary to educate citizens about the benefits of cloud-based voting, dispel misconceptions, and build trust in the system. Furthermore, legal and regulatory reforms must be introduced to establish a clear framework for electronic voting, ensuring compliance with data protection laws and electoral integrity standards. With careful planning, strong security measures, and widespread public engagement, cloud-based voting could help restore confidence in Nigeria's electoral system, strengthen democratic governance, and ensure that every vote is accurately counted and protected.

7. CONTRIBUTIONS TO KNOWLEDGE

This research contributes to knowledge by highlighting how cloud-based voting systems can enhance the security, transparency, and efficiency of Nigeria's electoral process. It provides insights into how advanced encryption and real-time data access can reduce electoral fraud, improve accessibility for remote voters, and cut election costs. By analyzing the legal and policy landscape, the study emphasized the need for regulatory reforms to accommodate digital voting. Additionally, it sheds light on potential risks, such as cybersecurity threats and political resistance, offering a balanced perspective on the feasibility of cloud-based voting.

The following recommendations are made from the results of this study : To successfully implement cloud-based voting in Nigeria, a phased approach is essential. First, pilot elections should be conducted in selected regions to assess feasibility, identify challenges, and build public confidence before a full-scale rollout. Strengthening cybersecurity infrastructure is also crucial, requiring advanced encryption, firewalls, and AI-driven threat detection to safeguard voter data and prevent cyberattacks. Additionally, legal and regulatory reforms must be enacted to provide a solid framework for cloud-based voting, ensuring compliance with international standards while addressing concerns about data privacy and security. Bridging the digital divide is another key priority, as improving internet access and digital literacy, particularly in rural areas, will ensure that all eligible voters can participate without technological barriers. Finally, nationwide public awareness campaigns should be launched to educate citizens on the benefits and security of cloud-based voting, addressing skepticism and fostering trust in the new system.

REFERENCES

1. Arun, K. C., Ahmad, S., Noor, S., Mumtaz, I., & Ali, M. (2022). Arduino based secure electronic voting system with IoT and PubNub for universities. *2022 Second International Conference on Advanced Technologies in Intelligent Control, Environment, Computing & Communication Engineering (ICATIECE)*, Bangalore, India, 1-5. https://doi.org/10.1109/ICATIECE56365.2022.10047605

2. Bannet, J., Price, D. W., Rudys, A., Singer, J., & Wallach, D. S. (2004). Hack-a-vote: Security issues with electronic voting systems. *IEEE Security & Privacy, 2*(1), 32-37. https://doi.org/10.1109/MSECP.2004.1264851
3. Dudeja, H., Kaushik, J., &Shalu. (2023). Cloud based voting system using blockchain technology. *2023 5th International Conference on Advances in Computing, Communication Control and Networking (ICAC3N)*, Greater Noida, India, 1392-1396. https://doi.org/10.1109/ICAC3N60023.2023.10541707
4. Emmanuel, E., Nwabueze, D. E., &Chukwuma, A. (2013). Analytical assessment of comparative advantage of deploying information technology (IT) for the election process in Nigeria. *2013 IEEE International Conference on Emerging & Sustainable Technologies for Power & ICT in a Developing Society (NIGERCON)*, Owerri, Nigeria, 52-58. https://doi.org/10.1109/NIGERCON.2013.6715639
5. Kumar, S., Akhtar, S., Ghosh, S., & Saini, K. (2022). Decentralized voting system. *2022 4th International Conference on Advances in Computing, Communication Control and Networking (ICAC3N)*, Greater Noida, India, 1885-1889. https://doi.org/10.1109/ICAC3N56670.2022.10074317
6. Ohammah, K. L., Thomas, S., Obadiah, A., Mohammed, S., & Lolo, Y. S. (2022). A survey on electronic voting on blockchain. *2022 IEEE Nigeria 4th International Conference on Disruptive Technologies for Sustainable Development (NIGERCON)*, Lagos, Nigeria, 1-4. https://doi.org/10.1109/NIGERCON54645.2022.9803127
7. Purkayastha, R., & Roy, A. (2021). Object oriented modelling of cloud voting system. *2021 Asian Conference on Innovation in Technology (ASIANCON)*, PUNE, India, 1-7. https://doi.org/10.1109/ASIANCON51346.2021.9544953
8. Ramyadevi, R., &Priya, V. (2024). Blockchain-powered e-voting system: A secure and transparent solution with three-tiered OTP security mechanism. *2024 IEEE International Conference on Computing, Power and Communication Technologies (IC2PCT)*, Greater Noida, India, 728-731. https://doi.org/10.1109/IC2PCT60090.2024.10486507
9. Thakur, S., Olugbara, O. O., Millham, R., Wesso, H. W., & Sharif, M. (2014). Transforming voting paradigm — The shift from inline through online to mobile voting. *2014 IEEE 6th International Conference on Adaptive Science & Technology (ICAST)*, Ota, Nigeria, 1-7. https://doi.org/10.1109/ICASTECH.2014.7068115
10. Ogala, E., Agbata, B. C., Akoh, R. O., Ashiru, A., & Johnson, A. (2022). Analysis of green cloud computing among computer users in Kogi State, Nigeria. *Journal of Software*, 3(5), 51–60.