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AN E-GOVERNANCE MODEL FOR IMO STATE, NIGERIA: TOWARDS IMPROVED INFORMATION ACCESS AND PUBLIC POLICY IMPLEMENTATION.

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ABSTRACT
This study developed an e-governance information system for Imo State that leverages ICT to improve access to government information, and citizen participation. The design aimed to create a data-driven culture that enhances transparency, accountability, and efficiency in public policy implementation. We adopted a systematic approach, combining both qualitative and quantitative methods of interviews, document reviews, and structured questionnaire to obtain measurable data. The UML was adopted for actual system design, while implementation followed the Agile Development methodology. Findings from functional testing and system validation reveal that the system significantly improves information access, service delivery in Imo state.

Keywords:
E-governance, ICT, E-GovInfo, Imo State, Public policy implementation.

1 INTRODUCTION

Electronic governance (e-governance) involves the use of technology, specifically, web-based applications to improve citizenship access to government information and service delivery to citizens, government agencies, business partners, and staff, at various levels. Advancements in Information and Communication Technology (ICT) has transformed the way governments interact with citizens and conduct administrative activities. Across the world, public administration has progressively embraced ICT to enhance transparency, accountability, and efficiency in governance, which is exactly what E-governance is all about. Structured application of digital technologies in delivering public services has also enabled citizen participation, and improved policy formulation and implementation in many countries.

Some African countries including South Africa, Kenya, and Rwanda have adopted innovative ICT strategies that digitize public services, leading to measurable improvements in citizen engagement and government performance. On a global scale, countries like Singapore and India have equally demonstrated how e-governance platforms could transform governance via improved citizenship empowerment, service delivery, and open data systems.

In Nigeria, various e-government initiatives have been launched at the national level, especially through government agencies such as the National Information Technology Development Agency (NITDA), which emphasize policy transparency, digital inclusion, and service delivery. In spite of these efforts by the Nigerian government, a good number of government institutions still lack the capacity to carry out their desired objectives to adequately engage with citizens or the private sector. Moreso, the civil society has been seen to lack the resources to effectively engage with government and advocate for change [1].

Apart from the shortcomings of existing models at the national level, implementation at the subnational level, particularly in many states, remains quite elusive. Imo State, for instance, located in the South-East region of Nigeria, faces persistent challenges in accessing timely government information, inefficient administrative processes, and limited public participation in policy decisions. The absence of a coordinated digital governance framework contributes to poor information flow between citizens and government agencies, resulting in delays in service delivery, policy misalignment, and reduced trust in public institutions.

Moreso, the absence of standardized platforms that enable citizens to interact directly with government institutions, provide feedback, or track policy implementation outcomes, has created a need for an e-governance system that supports real-time communication, open data access, and collaborative governance.

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While we acknowledge government's support for national e-governance frameworks in Nigeria, there is obviously a lack of state-level models tailored to local realities, especially in Imo State. Previous studies focused primarily on federal government initiatives, while neglecting how subnational governments can design and implement citizen-centric ICT platforms.

In order to bridge this gap therefore, this study has developed a customized e-governance model and web-based systems that reflects the peculiar administrative and infrastructural conditions of Imo State. The developed e-governance model was designed to leverage ICT to improve access to government information, promote citizen participation, and enhance public policy implementation.

The system will ultimately serve as a strategic framework to foster data-driven decision-making, transparency, and accountability in state governance. This is in line with global initiative where emerging information and communication technologies (ICT) has proved to facilitate the processes of governance and public administration as well as provide citizens with the ability to choose the manner in which they wish to interact with their governments [2].

2 LITERATURE REVIEW

2.1. The Concept of E-governance

E-Governance refers to the use of information and communication technologies (ICTs) by government institutions to deliver services, exchange information, and effectively engage with citizens, businesses, and other arms of government. According to the [3], e-governance is the application of ICT to transform relations with citizens, businesses, and other arms of government to improve service delivery, reinforce accountability, and strengthen participatory democracy.

For Nigeria as a developing economy, e-governance presents an opportunity to overcome traditional bureaucratic bottlenecks, minimize corruption, and promote inclusive governance by ensuring that citizens can directly access and contribute to governance processes.

Generally, e-governance is categorized into four major interaction components including:

i. **Government to Citizen (G2C):** Delivery of services and information directly to citizens through digital platforms (e.g., online tax payment, license renewal, information portals).
ii. **Government to Business (G2B):** Interactions between government agencies and business organizations (e.g., e-procurement, company registration, etc).
iii. **Government to Government (G2G):** Digital communication and data exchange among government departments and agencies for coordinated decision-making.
iv. Government to Employee (G2E): Automation of internal processes for efficiency in human resource and administrative management [4].

2.2. E-Governance in The Nigerian Context

Nigeria's journey towards e-governance began with the establishment of the National Information Technology Development Agency (NITDA) in 2001 and subsequent adoption of the National e-Government Master Plan (2019–2023). This plan emphasized digital inclusion, service automation, and the development of government portals. Despite these initiatives however, implementation remains uneven across states. Challenges such as inadequate ICT infrastructure, low broadband penetration, digital illiteracy, corruption, and resistance to change, have slowed progress. Many state-level initiatives still operate in isolation without a unified data-sharing framework or a citizen-oriented service platform [5].

For Imo State in particular, the absence of a dedicated e-governance model and integrated ICT framework has resulted in inefficiencies, information silos, and limited citizen access to government services. Therefore, this project seeks to bridge this gap by proposing a contextual model that aligns with the state's socio-political and infrastructural realities.

2.3. E-Governance and Public Policy Implementation

Public policy implementation refers to the process through which government decisions, programs, or laws are translated into actionable plans. Traditionally, implementation in Nigeria is hindered by poor communication, weak monitoring mechanisms, and a lack of accountability. The proposed E-Governance model in this study will provide a solution by enabling:

- Real-time monitoring of policy implementation progress.
- Centralized data repositories for performance evaluation.
- Digital feedback channels for citizens and stakeholders.

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- Cross-sector collaboration between ministries and agencies.

Based on research findings, integrating e-governance into policy processes can significantly improve policy coherence, evaluation, and public participation [5].

2.4. Empirical Review

In Nigeria, several studies have examined the challenges and prospects of e-governance:

- Adebayo and Ibietan (2022) emphasized that political commitment and citizen trust are critical success factors for sustainable e-governance implementation.
- Oluwaseun (2023) revealed that e-participation platforms at the state level remain underdeveloped, leading to poor citizen feedback and limited access to public information.
- Ojo et al. (2021) found that lack of interoperability among government agencies hampers the adoption of integrated e-governance platforms

These studies individually highlight the need for localized models that consider the unique socio-political dynamics and infrastructural realities of Nigerian states.

3. MATERIALS AND METHODS

In this study, we focused on the development of an e-governance information system (E-GovInfo) for Imo State, Nigeria. We are interested in the architectural design as well as model implementation using standardized web development tools and technologies.

This section describes the procedures used for data collection and analysis, evaluation of existing governance procedures in Imo State, and the development of the proposed e-governance model. The section also outlines the various system requirements, design methodology, and the various web development tools used for the proposed system.

3.1. Research Design

This study adopts a mixed-method approach which combines both qualitative and quantitative methods. The qualitative aspect involves interviews and document reviews to understand existing service procedures, while the quantitative aspect utilizes structured questionnaires to obtain measurable data on information accessibility and service efficiency.

Data collection was followed by an exploratory evaluation, which suitably support the identification of patterns, relationships, and gaps in the current governance system of Imo State. The exploratory evaluation basically provides the foundation for the design and implementation of a suitable e-governance model and system.

3.2 Population and Sampling

For data gathering process in this study, we focused the following:

- Government ministries, departments, and agencies (MDAs) in Imo State;
- Selected civil servants and ICT officers;
- Representatives of the civil society groups;
- Ordinary citizens that regularly access government services.

A stratified sampling technique was used to select participants based on their relevance and involvement in government service delivery or public policy processes. We made use of a sample of 150 respondents (comprising government officials and citizens) which was equally considered adequate for the exploratory analysis.

3.3 Data Collection

In order to achieve our research objectives, we made use of multiple data collection instruments, including:

1. Questionnaire: Structured questionnaires were distributed with the aim of collecting quantitative data on citizens' access to government information, efficiency of current procedures, and perception of full ICT usage in the governance of Imo State.
2. Interviews: Semi-structured interviews were conducted with selected government officials, policy makers, and ICT experts. The aim was to gain deeper insights into current governance operations and challenges.
3. Document Review: Government documents, and policy reports were equally analyzed to assess existing e-governance status and public information dissemination to citizens.
4. Observation: We also carried out on-site visits to selected ministries and agencies in order to gain first-hand knowledge on workflows, communication channels, and bottlenecks in information flow.

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3.4 Exploratory Evaluation of Existing Service Procedures

The first objective of this study is the evaluation of status and weaknesses of existing service delivery and procedures in Imo State. Another is a SWOT (Strength, Weakness, Opportunities, Threats) analysis of existing regulations, was conducted to identify all factors affecting policy implementation and e-governance adoption in the State. These discoveries guided the design of a sustainable and adaptable e-governance model that captured her peculiarities.
The evaluation was particularly achieved via the following:

- Mapping the service flow of selected government agencies.
- Identification of gaps such as delays, data inconsistences, and key transparency issues.
- Assessment of citizen awareness levels and accessibility of public policy information.

The table 1 shows the factors affecting policy implementation and e-governance initiatives in Imo State as identified by the SWOT analysis.

Table 1. Factors affecting policy implementation and e-governance adoption.

S/N	Opportunities	Threats
1.	Growing public interest in digital services	Political interference
2.	Federal support for digital transformation	Resistance to change
3.	State government's commitment to improving service delivery	Inadequate funding
4.	Availability of open-source tools.	Cybersecurity risks.

3.5. Design Methodology

The Waterfall approach of the Software Development Life Cycle (SDLC) was used for this project because it is ideal for such projects with clearly defined requirements, and allowing for a structured and sequential approach to system design. The phases include:

1. Requirement Analysis
2. System Design
3. Implementation
4. Performance testing
5. Deployment and Maintenance

For the Design phase, we adopted the Unified Modeling Language (UML) diagrams to enable easy visualization of system structures, interactions, and behavioral pattens.
For the Implementation phase, we adopted the Agile Development Methodology due to its flexibility and iterative nature, allowing continuous feedback from stakeholders and enabling adaptive modifications based on real-time user needs.
For each phase, the following were particularly considered:
Phase I: Prototype design, involving initial interface outlook and software application.
Phase II: Database design, involving creation of ER diagrams and data definition/ structures.
Phase III: Coding, involving implementation of system functionalities using chosen tools.
Phase IV: Testing, involving the conduct of unit, integration, and user acceptance tests.
Phase V: Deployment, involving application hosting on a secure web server for live use.
Phase VI: Validation, involving conduct of pilot testing with selected government agencies.

3.6. The Proposed E-governance Framework

The e-governance system in this study was deployed on the public network as shown in figure 1 where government agencies are enabled to provide quality access to information as well as interact electronically with citizens; political groups are enabled to run online advocacy campaigns; and the media and portal/search sites, which are enabled to play a crucial role in providing news and online navigation. In this model also, the private sector and the civil society groups were activated to support a data-driven decision-making, citizen engagement, and policy monitoring as depicted in the figure 1.

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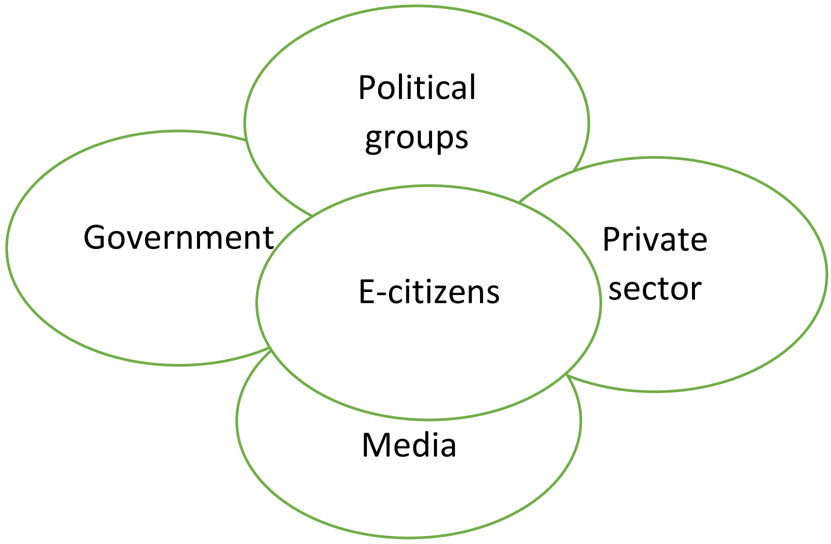

Figure 1: The proposed E-governance framework in the public network

3.6.1. Requirement Analysis

Our findings from the exploratory evaluation revealed both functional and non-functional system requirements for the proposed E-Governance Information System for Imo State, categorized as follows:

3.6.1.1. Functional Requirements

The system is expected to:

1. Allow multi-level authentication for admin, staff, and citizen.
2. Enable citizens to submit structured feedback to improve governance, make complains and offer suggestions.
3. Enable citizen participation through polls and surveys.
4. Allow accessibility by low-bandwidth, low-literacy, and a multilingual population by incorporating accessibility features such as Voice Prompts, Multiple Language selection modules, and a Simple Mode support.
5. Provide public access to government information and policy documents.
6. Enable citizens to make inquiries from relevant government agencies.
7. Allow government administrators and the media to upload official announcements, government news, policies, and programs.
8. Maintain secure data storage and retrieval for all transactions.
9. Provide government dashboard to manage citizen input, performance monitoring, and analysis.

3.6.1.2. Non-Functional Requirements

- Security: There should be role-based access control, and encryption of sensitive data.
- Usability: Intuitive user interface, responsive design for both mobile and web users.
- Scalability: System should accommodate additional modules as government expands its digital services.
- Performance: Optimized for fast loading and minimal server downtime.
- Maintainability: Use of modular architecture for easy updates.

4.1. Architectural Design of the New E-GovInfo

The design approach adopted for our proposed system is such that integrates data-driven decision-making, citizen engagement, and policy monitoring components into a unified architecture that reflects the peculiarities of Imo State's governance ecosystem.

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Therefore, a Three-Tier Web Architecture was adopted, consisting of a presentation layer, an application layer, and a database layer.

The E-GovInfo application design also followed a client-server architecture. The frontend was implemented basically as a React Native application managed with Expo, which could enable builds for Android, iOS, and web export. The backend was implemented with a RESTful API, supported with Express.js and MongoDB. While authentication was handled using JWT tokens. Detailed architectural design was therefore managed as follows:

1. Presentation Layer (User Interface)
   - Provides user-friendly interfaces for citizens, government officials, and administrators.
   - Developed using React Native, and Node.js 18+ to ensure interactivity, responsiveness and efficiency.
   - Enhanced using expo-speech for voice prompts, Storybook for UI documentation, Expo Router for navigation, React Native to manage Expo workflow, react-native-reanimated for performant animations, and the AsyncStorage for local persistence.
   - Includes modules for service requests, feedback submission, public announcements, and policy dashboards.
2. Application Layer (Logic and Services)
   - Implements the business logic, data validation, and system rules.
   - Developed using Node.js with Express.js for REST API
   - Integrates APIs for authentication, data exchange, and analytics.
   - Handles communication between the user interface and database layer.
3. Data Layer (Database Management System)
   - Uses Mongoose for MongoDB schema and ORM to manage all government data and user interactions, bcrypt for password hashing, and the jsonwebtoken (JWT) for session tokens.
   - Stores datasets on citizens, policy records, government projects, and transaction logs.

System architecture of the proposed E-GovInfo is presented in figure 2.

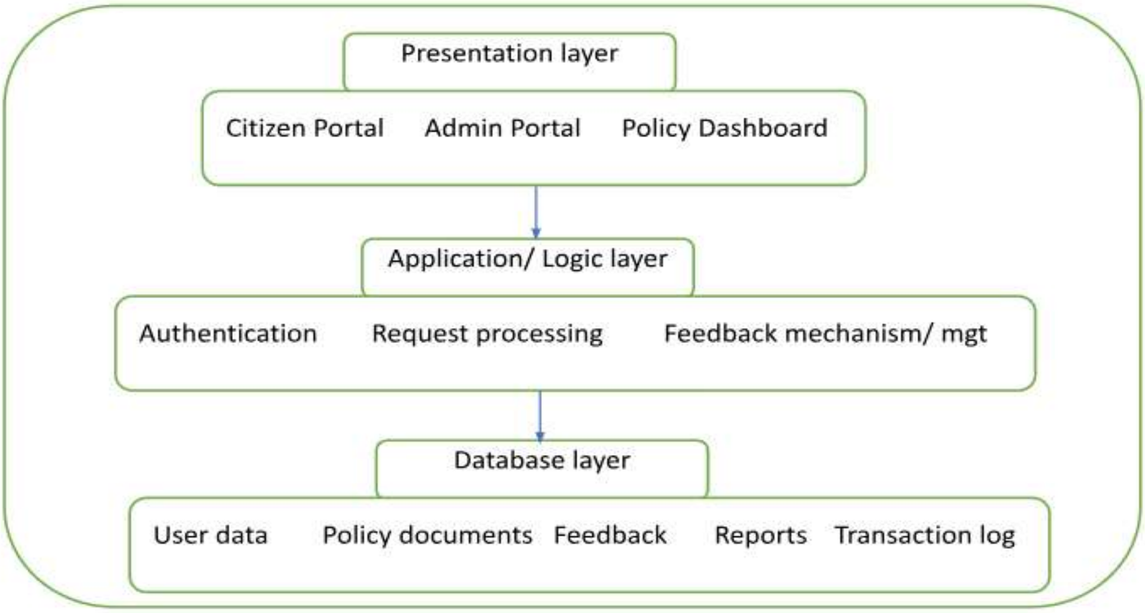

Figure 2. System architecture

4.1.1. Actors and Use Cases for the E-GovInfo

The E-GovInfo has the following actors and use cases:

Actors:

- Citizen
- Government Administrator

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- Sub-systems

Use Cases:
- Register
- View government information
- Submit feedback/inquiry
- View policy updates
- Vote in pool
- Upload and manage policy documents
- Update profile
- Generate reports
- Search for news and updates

4.1.2. Activity Diagram
Activity Diagram of the proposed E-GovInfo is shown in figure 3.

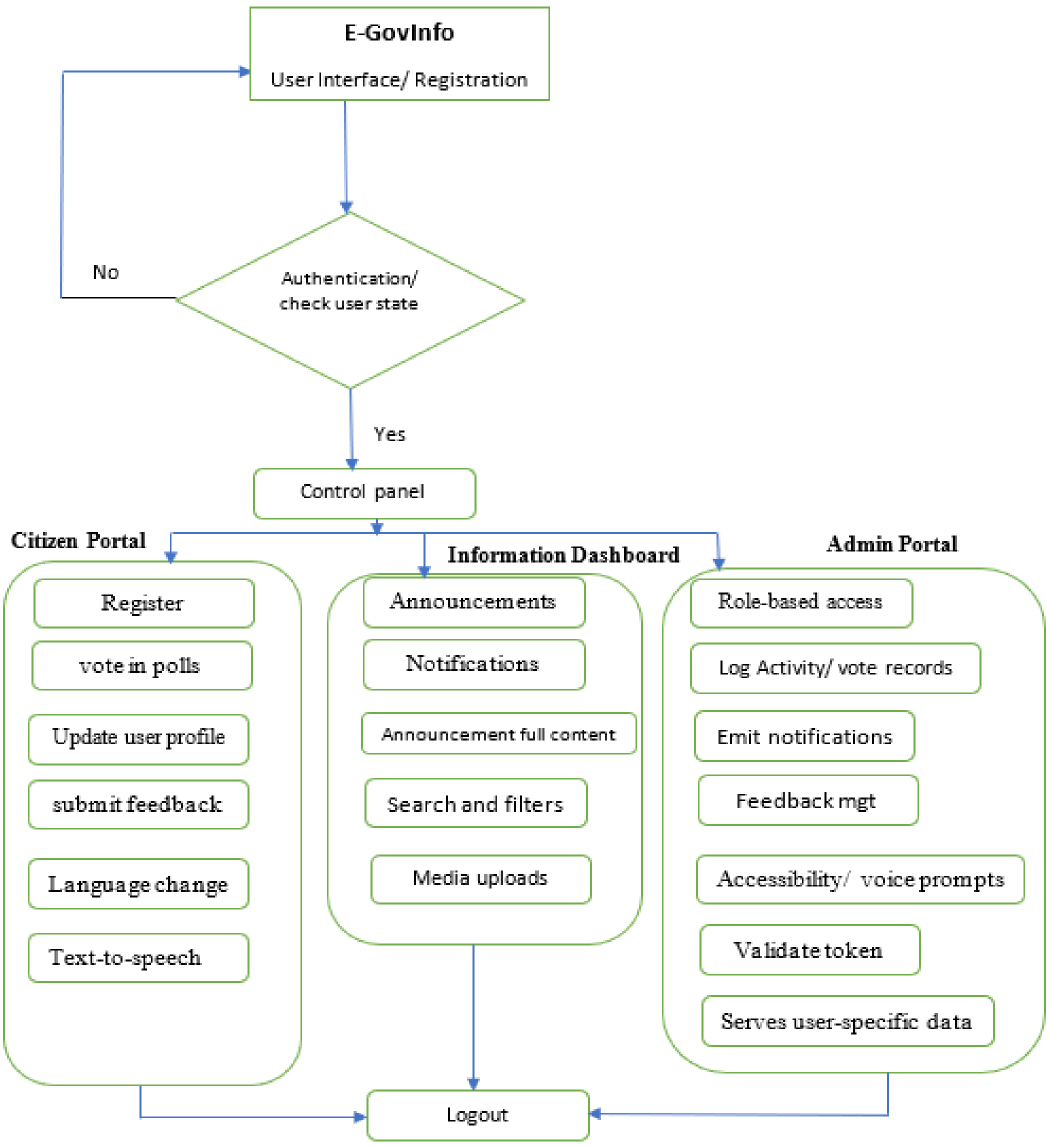

Figure 3. Activity Diagram of the proposed E-GovInfo for Imo State

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4.2. Major System Modules and Features

Table 2 illustrates the major features of the proposed E-governance Information System for Imo State, showing individual system modules, basic descriptions, and target users.

Table 2. E-GovInfo modules and basic features.

S/N	E-GovInfo Module	Description	Target user
1.	User Management Module	Registration, login, and role-based access control.	Citizens/ State officials
2.	Language change	Allow users to change to local language of choice	All users
3.	Text-to-speech	Allow users to use text-to-speech option	All users
4.	Update profile	Allow citizens to update their profile	Citizens
5.	Service Request Module	Enables citizens to apply for services, permits, and licenses online.	Citizens
6.	Information Dashboard	Displays active policies, News, budgets, and implementation updates.	Citizen/ Guests
7.	Feedback and Grievance Redress Module	Allows citizens to submit their complaints, feedback or enquiries.	Citizens
8.	Analytics and Reporting Module	Provides real-time statistics for decision-making.	State officials
9.	Notification Module	Sends email/SMS alerts for application status and policy updates	All Users
10.	Pools	Allow citizens to vote in pools	Citizens
11.	Manage password	Allow citizens to manage their login details	Citizens

4.3. Tools and Technologies

Details of various tools and web technologies used in the development, testing and deployment of various aspects of our E-GovInfo are as shown in table 3.

Table 3. Tools and technologies used for E-GovInfo development.

S/N	E-GovInfo component	Technology used
1.	Frontend development	React Native, Node.js 18+ for frontend and backend builds and server runtime
2.	Backend development	Node.js with Express.js for REST API
3.	Database management system	Mongoose for MongoDB schema and ORM (for persistent data storage).
4.	Data fetching and caching	React Query (@tanstack/react-query) for data fetching and caching
5.	Password hashing	bcrypt for password hashing
6.	Performant animations	React-native-reanimated for performant animations
7.	UI documentation	Storybook for UI documentation
8.	Type safety	TypeScript for type safety
9.	Package/ dependency management	npm for package management
10.	Version control	Git for version control
11.	Type-check, export smoke test	GitHub Actions
12.	Voice prompt management	Implemented with expo-speech (with callbacks to ensure audio completes before navigation).
13.	Navigation	Expo Router for navigation
14.	Session tokenization	jsonwebtoken (JWT) for session tokens
15.	Server/ web hosting	Small cloud instance (I vCPU, 1-2GB RAM) for prototype deployment

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5.1. System Testing and Validation

System testing was carried out to ensure that the new system meets the target objectives in this study as well as confirm that the various aspects of the developed E-GovInfo passed the specified test cases, met functional specifications as well as performed optimally under local conditions. The following testing approaches were adopted:

1) **Unit Testing:**
   Testing of individual modules and functions.
2) **Integration Testing:**
   Verification of data flow between modules.
3) **System Testing:**
   Evaluating the system as a complete product.
4) **User Acceptance Testing (UAT):**
   Engaging government officials and selected citizens to test system usability and functionality.
   The table 4 shows the testing parameters used:

Table 4. Testing parameters

S/N	Test type	Objective(s)	Result expectation
1.	Functional Test	To Verify all system functions as specified.	Pass
2.	Usability Test	To verify ease of use and accessibility.	High user satisfaction
3.	Performance Test	To measure system response time and stability.	Fast, reliable performance
4.	Security Test	To test access control and data protection.	Secure and resilient

5.1.1. System Validation

Finally, a validation exercise was conducted by evaluating the system against the design objectives and stakeholder expectations. Feedback from selected government departments, which included the Ministries of Information, Ministry of Finance, Ministry of Works, and civil society groups (over a six (6) months' period) confirmed that the system enhanced:

- Access to government information and services.
- Timeliness of policy updates.
- Transparency and accountability in public service delivery.

6.1. **Results and Discussion**

This section presents the results obtained from the implementation and testing of the E-Governance Information System (E-GovInfo) for Imo State. The primary aim of the system is to enhance public access to information, simplify government/ citizen interactions, and promote a culture of data-driven decision-making within the Imo State's governance structure.

Breakdown of the findings derived from the system development and pilot testing include the following:

1. Outcome of Exploratory Analysis revealed that most service delivery processes in Imo State were manual, time-consuming, and lacked transparency. Information about government activities and policies was scattered across departments with little integration or citizen access.
2. Outcome of SWOT Analysis revealed the following:
   - Strengths: Government willingness to adopt digital transformation and a growing ICT infrastructure.
   - Weaknesses: Bureaucratic delays, limited data integration, and lack of ICT skills among civil servants.
   - Opportunities: Federal e-government policies, donor support for ICT initiatives, and high citizen internet adoption rates.
   - Threats: Cybersecurity risks, political interference, and low funding for ICT sustainability.
3. Outcome of System Implementation: The developed E-GovInfo provided integrated modules for service request management, policy dashboards, analytics, and grievance redress. The system achieved

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smooth data communication between modules and offered a simple, intuitive user interface accessible from both mobile and desktop devices.

4. Results of system testing revealed the following:
   - Functionality: All major modules passed the specified test cases.
   - Usability: User satisfaction was rated high (average 4.5/5 in pilot surveys).
   - Performance: System response time remained under 3 seconds for typical requests.
   - Security: The authentication module prevented unauthorized access during penetration tests. No user could register more than once.
   - Scalability: The system successfully handled simultaneous access from 50 concurrent users during pilot testing.
5. Validation: Stakeholder feedback confirmed that the system significantly improves the speed, transparency, and traceability of government services. The policy dashboard was particularly commended for enabling real-time monitoring of policy implementation.

Table 5 presents an interpretation of performance results and evaluation for the developed E-GovInfo.
Table 5. Results and interpretation of system performance evaluation

S/N	Evaluation Criteria	Indicator/ Metric	Result	Interpretation
1	Usability	Average user satisfaction score	4.5/5	Excellent interface design
2	System Uptime	Operational time ratio	98%	Highly reliable
3	Response Time	Average request processing time	<3s	Fast and efficient
4	Security	Unauthorized access attempts blocked. Impossible to register twice as a user. Impossible to vote more than once in pools and surveys	100%	Secure system
5	Scalability	Concurrent users supported	50 users	Suitable for pilot stage
6	Data Accuracy	Transaction success rate	99%	Reliable data handling

Findings therefore revealed a tested E-Governance Information System prototype that can be scaled for broader adoption across Nigerian states, providing empirical evidence for policymakers that digital governance could enhance accountability and service delivery.

6.2. **Screenshots from the E-GovInfo System**

A few of the screenshot from the developed E-GovInfo is displayed in figures 4 and 5.

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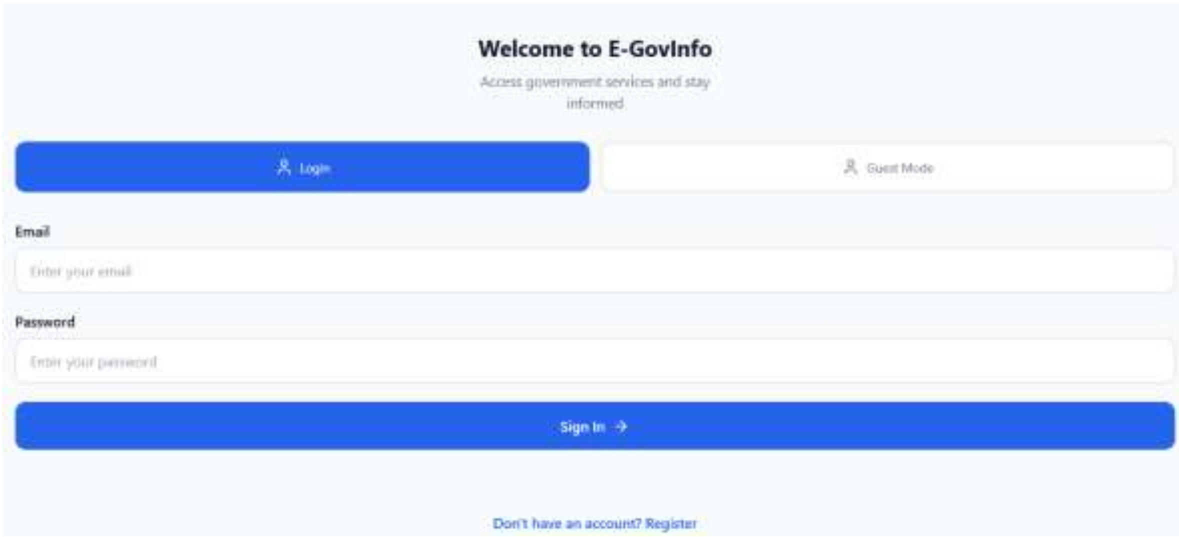

Figure 4. E-GovInfo login page

Figure 5. E-GovInfo registration page

7.1. CONCLUSION

This study has successfully developed, and validated an E-Governance Information System called E-GovInfo, tailored particularly to the governance needs of Imo State, Nigeria. The system has demonstrated that ICT-driven governance can significantly enhance transparency, accountability, and efficiency in public policy implementation. By institutionalizing the proposed e-governance model, Imo State can create a participatory and data-driven culture of governance that strengthens democratic values and sustainable socio-economic development.

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