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Local–Hybrid Web-Based Voter Education Awareness Campaign Platform

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ABSTRACT

Voter education plays a significant role in promoting informed and responsible participation in democratic processes; however, many local communities face challenges in accessing reliable and structured voter education resources due to limited internet connectivity and reliance on informal information channels. This study presents a local–hybrid web-based voter education awareness platform designed to deliver accessible, multimedia-driven educational content for community use by integrating locally hosted infrastructure with cloud-mediated access services, enabling both local control and remote accessibility. The platform was developed using an iterative–incremental methodology and evaluated based on the ISO/IEC 25010 Software Product Quality Model. Evaluation results indicate that the system achieved high performance across key quality characteristics, including functional suitability, usability, performance efficiency, security, and maintainability. The findings demonstrate that hybrid deployment models can effectively address accessibility constraints while maintaining system quality and reliability, thereby offering a scalable and practical approach for delivering voter education in resource-constrained community environments.

Keywords: Voter education, Web-based systems, Hybrid deployment, Software quality, ISO/IEC 25010, Community platforms

INTRODUCTION

In recent years, the use of digital platforms for civic engagement and voter education has expanded significantly as governments and civil society organizations attempt to improve democratic participation. However, the increasing reliance on digital channels has also introduced challenges related to disinformation and the manipulation of online information ecosystems, affecting the reliability of civic information dissemination (Kertysova, 2018). In addition, issues such as misinformation, unequal access to reliable information, and disparities in digital literacy across communities continue to hinder effective digital participation. Research on digital citizenship emphasizes that structured and accessible information systems are essential in enabling informed participation and mitigating exposure to misleading content (Diepeveen & Pinet, 2022).

The digital divide remains a persistent barrier to civic engagement, particularly in communities with limited access to stable internet infrastructure, which constrains participation in digital civic platforms (Bennett, 2008). While cloud-based platforms provide scalability and accessibility, they often assume consistent connectivity and modern infrastructure, reflecting broader shifts in computing toward cloud, edge, and distributed paradigms (Gill et al., 2024). In many developing communities, these assumptions are not always applicable, limiting the effectiveness of purely cloud-based educational platforms. Consequently, hybrid deployment models that combine locally hosted infrastructure with selective cloud-based services have emerged as a viable approach for community-oriented systems, offering improved control over resources while maintaining remote accessibility (Zhang et al., 2010).

However, existing voter education systems remain largely cloud-centric and often lack adaptability in environments characterized by intermittent connectivity and varying levels of digital literacy. In addition, reliance on externally managed or static content restricts local control over information delivery and timely

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updates. These limitations highlight a critical gap in the development of localized, flexible, and multimedia-driven voter education systems that can operate effectively under constrained infrastructure conditions.

Voter education remains a fundamental component of democratic participation, as it provides citizens with essential information about electoral processes, candidate qualifications, and government responsibilities, enabling more informed and accountable voting decisions (Tigno, 2023). However, in many local communities, particularly at the barangay level, access to structured and reliable voter education resources remains limited due to infrastructural constraints and the continued spread of misinformation during election periods (United Nations Development Programme, 2025). To address these gaps, evidence suggests that well-designed voter education initiatives can enhance voter confidence in electoral processes, particularly in vote counting, by improving voter experiences and fostering a culture of information dissemination during elections (Suttmann-Lea, 2023), reinforcing the need for accessible and structured learning platforms.

In response to these challenges, this study proposes the design, development, and evaluation of a local–hybrid web-based voter education awareness platform. The system is deployed on a locally managed server infrastructure and securely exposed to the internet through cloud-mediated access services, combining the reliability and control of local hosting with the accessibility of online delivery. The platform functions as a centralized repository of multimedia voter education materials designed to improve engagement, comprehension, and accessibility for community users. This study aims to design, implement, and evaluate a local–hybrid web-based voter education platform that addresses accessibility challenges in community environments. Specifically, it focuses on: (1) developing a modular and secure web-based system, (2) integrating multimedia educational content to enhance user engagement, and (3) evaluating system quality using the ISO/IEC 25010 framework.

The primary contribution of this study is the development and empirical evaluation of a local–hybrid web-based voter education platform designed for resource-constrained community environments. It demonstrates the practical implementation of a hybrid deployment architecture integrated with multimedia learning and controlled content management, providing a scalable and adaptable approach to voter education delivery. In addition, it contributes empirical evidence on the applicability of the ISO/IEC 25010 Software Product Quality Model in evaluating civic technology platforms. The system is intended strictly for non-partisan educational purposes.

METHODOLOGY

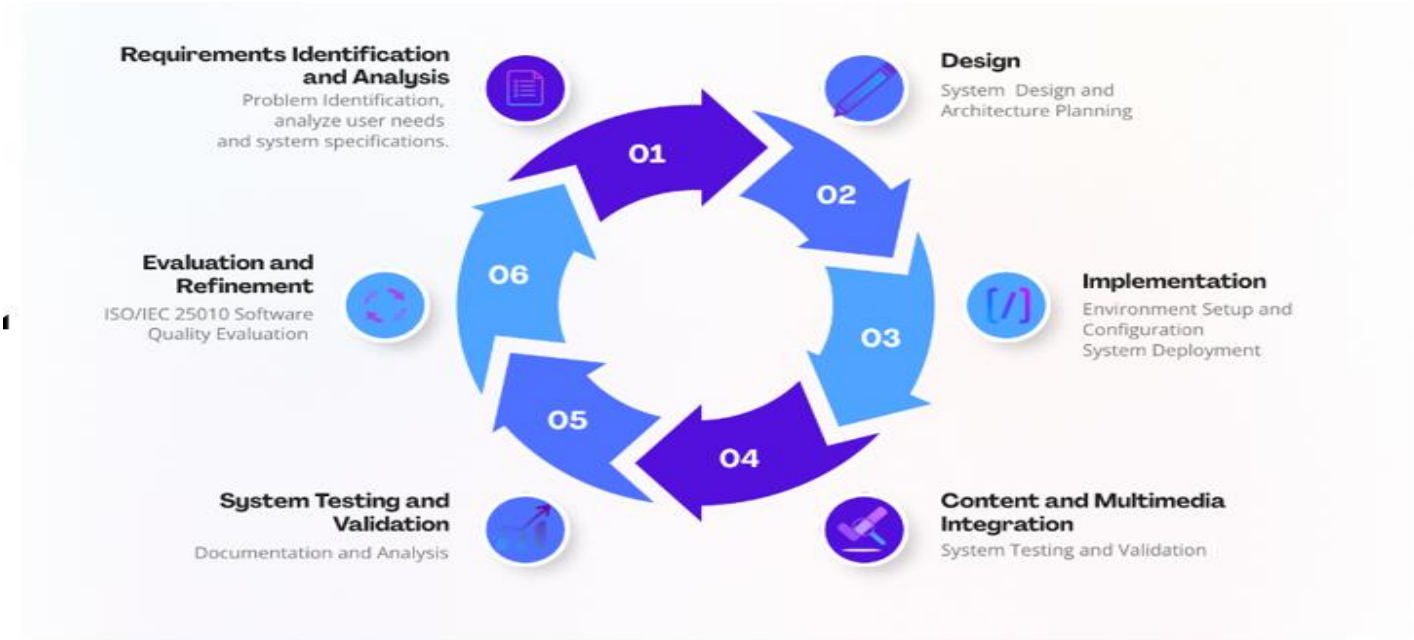

Figure 1. The development process follows an iterative–incremental approach, allowing repeated cycles of requirement identification and analysis, design, implementation, content integration, system testing and

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validation, and evaluation and refinement to progressively refine system components. This system development approach consists of system design, infrastructure setup, platform deployment, and evaluation phases. The process began with the identification of the voter education platform requirements followed by the design of the layered architecture. The system environment was then configured within a virtualized infrastructure and integrated with secure networking through Cloudflare Tunnel. Platform components including the Nginx web server, Flask backend API, Gunicorn application server, and PostgreSQL database were subsequently deployed. The final stages involved system testing and evaluation using the ISO/IEC 25010 software quality model.

Research Design and Development Approach

This study adopts a quantitative research approach utilizing the ISO/IEC 25010 Software Product Quality Model as the primary evaluation instrument. The quantitative approach enables the system to be assessed using measurable criteria based on predefined software quality characteristics. Data were collected through structured evaluation forms completed by selected respondents, and results were analyzed using descriptive statistics such as mean scores and interpretation scales.

The evaluation focused on key quality characteristics including functional suitability, usability, performance efficiency, reliability, security, and maintainability. This approach ensures that system assessment is objective and measurable, consistent with established software quality evaluation practices based on ISO/IEC standards.

In terms of software development, the study follows an iterative–incremental software development life cycle (SDLC) model. This approach allows the system to be developed in phases, where each iteration produces a functional component that can be tested and refined. The iterative model supports continuous improvement, early detection of issues, and progressive system enhancement, making it suitable for developing web-based information systems in dynamic environments (Pressman et al., 2020).

The combination of a quantitative research approach and an iterative development model enables systematic measurement of system quality and continuous refinement based on evaluation results.

Iterative – Incremental Development Phase

The development of the proposed voter education platform followed an iterative–incremental software development life cycle (SDLC) model. This model divides the system development process into multiple cycles, where each iteration produces a functional component that is tested and refined before proceeding to the next stage. This approach enables gradual system evolution while ensuring continuous validation of system functionality and performance.

The development process was organized into the following phases:

Requirements Identification and Analysis

The initial phase involved identifying the core requirements of the voter education platform, including accessibility, multimedia content delivery, and secure remote access. Key challenges such as limited internet connectivity, reliance on informal information sources, and the need for structured educational materials were considered in defining system objectives. This phase established the functional scope and guided subsequent design decisions.

System Design and Architecture Planning

In this phase, the overall system architecture was defined using a layered design approach. The platform was structured into presentation, application, and data layers to ensure modularity and maintainability. Design decisions also included the adoption of a local–hybrid deployment model, integrating locally hosted infrastructure with cloud-based access through Cloudflare Tunnel. Architectural components such as Nginx, Flask, Gunicorn, and PostgreSQL were selected to support system requirements. Carvallo & Franch (2019) emphasize the importance of understanding software usage patterns to support reliable and error-free API

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integration in software systems, which informed the careful coordination and interaction of backend components in the proposed architecture.

Environment Setup and Configuration

The system environment was prepared by deploying a virtual machine running Ubuntu Server within a VMware-based Homelab infrastructure. Core system configurations included user management, directory structure initialization, firewall configuration, and service isolation. Secure networking was established using Cloudflare Tunnel to enable encrypted external access without exposing the local network directly to the internet.

System Development and Integration

During this phase, the core platform components were developed and integrated. The Nginx web server was configured as a reverse proxy, while the backend application was implemented using the Flask framework and served via Gunicorn. PostgreSQL was configured for persistent data storage. Integration activities ensured that all components functioned cohesively as a unified web-based system.

Content and Multimedia Integration

The platform was enhanced by incorporating multimedia educational materials, including videos, infographics, and text-based resources. This phase focused on improving user engagement and supporting diverse learning preferences. Content organization and delivery mechanisms were designed to ensure accessibility and clarity for community users.

System Testing and Validation

System testing was conducted to verify functionality, accessibility, and performance. Validation activities included testing API endpoints, verifying web content delivery through the configured domain, and assessing system responsiveness under both local and remote access conditions. System services were also configured for automatic startup to ensure operational stability.

Evaluation and Refinement

The final phase involved evaluating the system using the ISO/IEC 25010 Software Product Quality Model. Quality characteristics such as functional suitability, usability, performance efficiency, reliability, security, and maintainability were assessed. Findings from the evaluation were used to refine system configurations and improve overall system quality.

Category	Description	Number of Respondents
IT Experts	Professionals with experience in software development, networking, or system administration	3
Software Quality Assurance Testers	Expert SQA Testers with experience in software testing and evaluation	3
End-Users	Individuals representing community users of the platform	3
Total		**9**

The system evaluation involved a total of nine respondents representing different stakeholder groups. This includes IT professionals, Software Quality Assurance experts, and representative end-users to ensure a balanced and comprehensive evaluation of the system from technical, usability, and practical perspectives.

System Design Phases

The system design phase ensures that all system components are clearly defined before implementation. The

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use of UML, DFD, and ERD diagrams provides a structured representation of system interactions, data flow, and data relationships. These design artifacts support system maintainability and serve as a reference for implementation and future system enhancements.

Design Sub-Phases

The system design phase was divided into several sub-phases to ensure a structured and modular development approach. These sub-phases include architectural design, data design, process design, and user interaction design. Each sub-phase focuses on a specific aspect of the system to improve maintainability, scalability, and usability.

High-Level System Architecture

The system architecture is composed of three primary components: peopleware, software, and hardware. Peopleware includes end-users such as community members accessing voter education materials and administrators responsible for managing content. Software components consist of the web server (Nginx), backend application (Flask running on Gunicorn), database system (PostgreSQL), and cloud networking services (Cloudflare Tunnel). Hardware infrastructure includes the Homelab server environment, consisting of a virtual machine hosted on a physical mini-PC with sufficient processing, memory, and storage resources to support the platform.

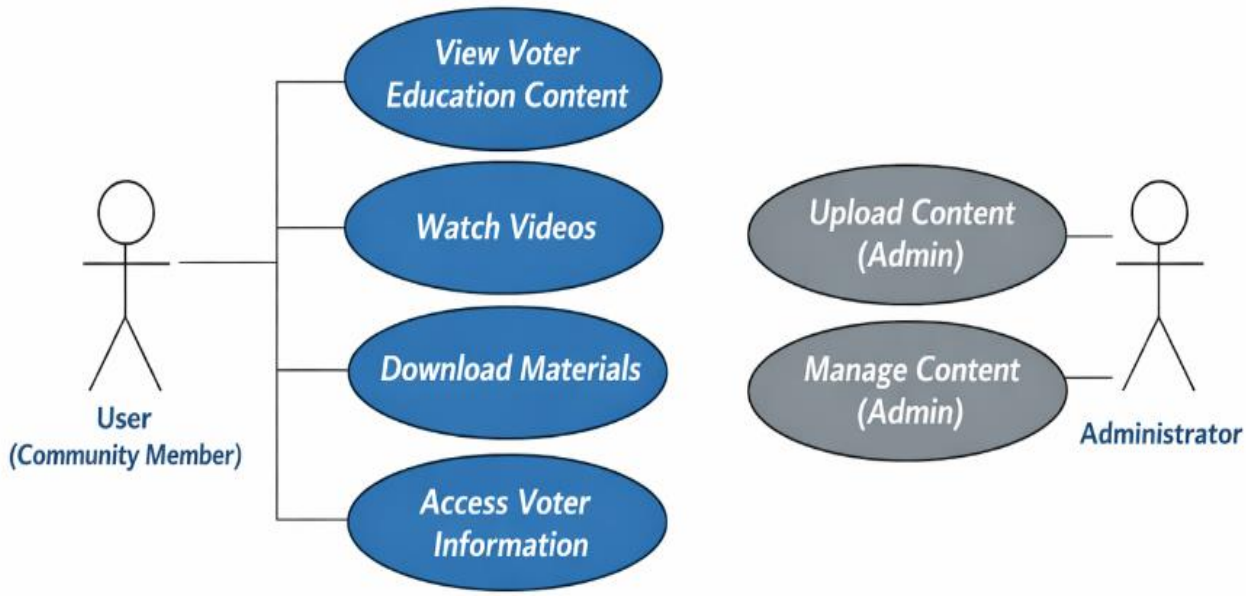

Figure 2. UML Use Case Diagram of the Voter Education Platform

The UML Use Case Diagram illustrates the interaction between two primary actors: the Community User and the Administrator. Community users access the platform to view voter education content, watch videos, download materials, and obtain relevant voter information. These functions support the system's objective of delivering accessible and structured educational resources to promote informed civic participation. The Administrator is responsible for managing platform content through functionalities such as uploading and maintaining educational materials. The diagram highlights a role-based access control structure, where administrative privileges are restricted to authorized users while general users are limited to content access. This separation ensures system security, maintainability, and efficient content delivery within the platform.

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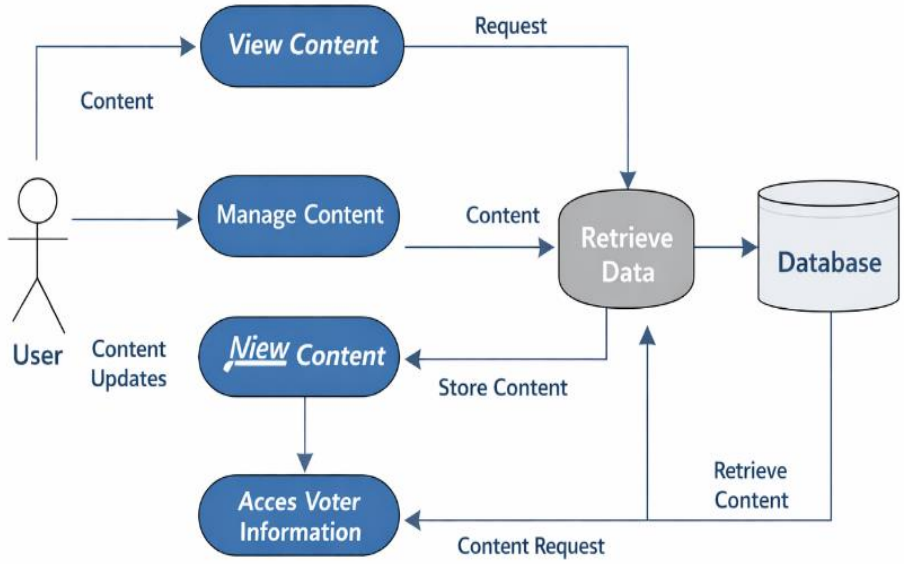

Figure 3. Data Flow Diagram of the Voter Education Platform

The Data Flow Diagram (DFD) illustrates how user interactions are processed within the voter education platform and how data flows between system components. The User initiates actions such as viewing content, accessing voter information, or managing content. These requests are routed to the system process responsible for data retrieval, which communicates with the database to fetch or store relevant information. The database serves as the central repository for educational materials and system data. The diagram also shows bidirectional data flow between the system and the database, where content requests result in data retrieval, while administrative actions lead to content updates and storage. This flow ensures that users receive accurate and updated information while maintaining data consistency. Overall, the DFD highlights the system's structured data handling, supporting efficient content delivery, and reliable information access.

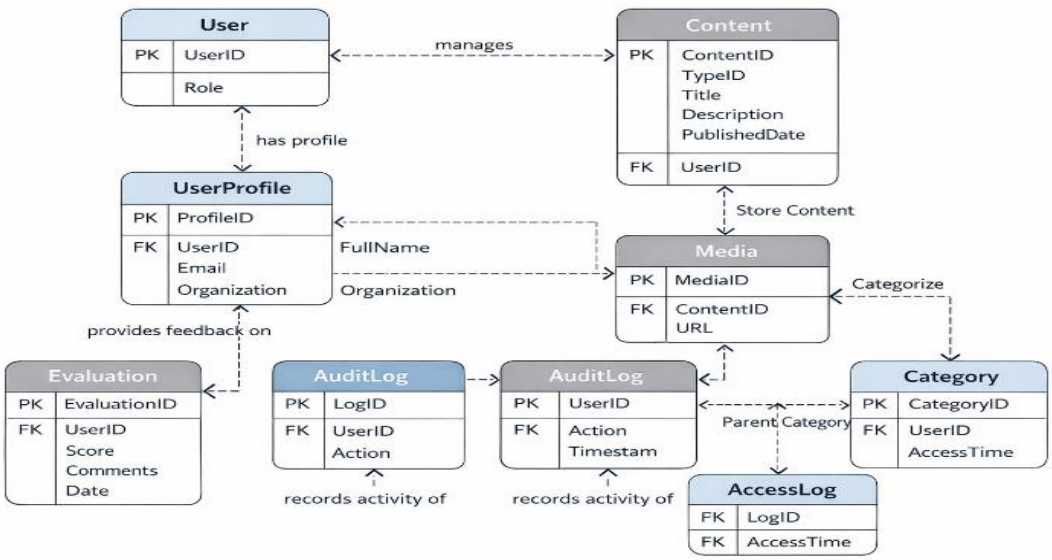

Figure 4. Entity Relationship Diagram

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The database design was further expanded to support future scalability and additional system functionalities. New entities such as user profiles, content types, audit logs, evaluation records, and access logs were incorporated to enhance system maintainability, traceability, and analytical capabilities. These enhancements enable the system to support user management, content classification, activity monitoring, and integration of evaluation data. The improved entity relationships also allow for future system extensions such as authentication mechanisms, usage analytics, and advanced content organization through hierarchical categories.

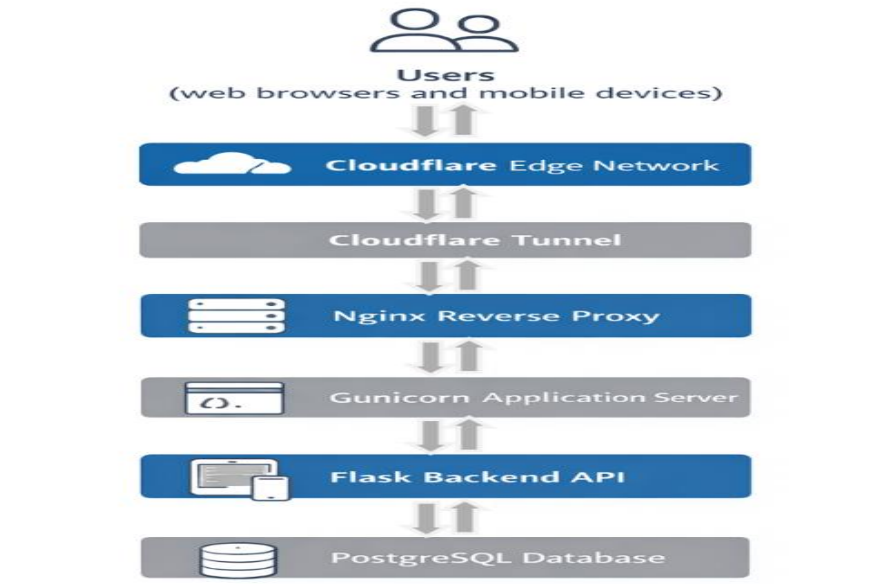

Figure 5. The system architecture of the proposed voter education platform follows a layered web application model. User requests originating from web browsers and mobile devices are first routed through the Cloudflare edge network and securely forwarded through a Cloudflare Tunnel to the locally hosted infrastructure. The Nginx web server functions as a reverse proxy that forwards requests to the backend application layer running on the Gunicorn application server. The backend application is implemented using the Flask web framework, which processes application logic and interacts with the PostgreSQL database for persistent storage of platform content and system data.

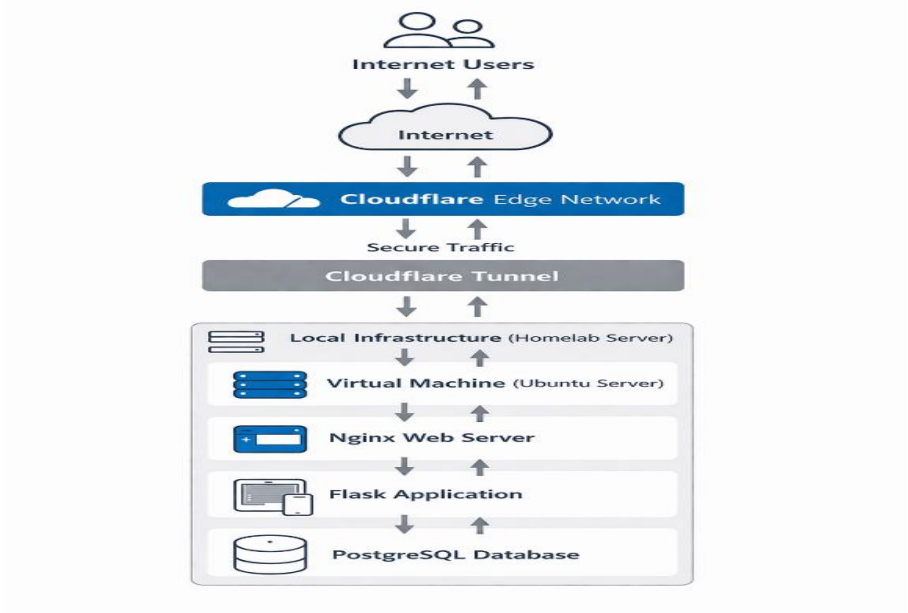

Figure 6. The deployment architecture illustrates the local–hybrid infrastructure used to host the voter education awareness platform. Core system components are deployed within a homelab environment on a virtual machine running Ubuntu Server. Public access to the system is enabled through a secure Cloudflare Tunnel, which routes

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encrypted traffic from the Cloudflare edge network to the internal web server without exposing the local network to direct internet access. This architecture allows the platform to maintain local infrastructure control while providing secure remote accessibility for community users.

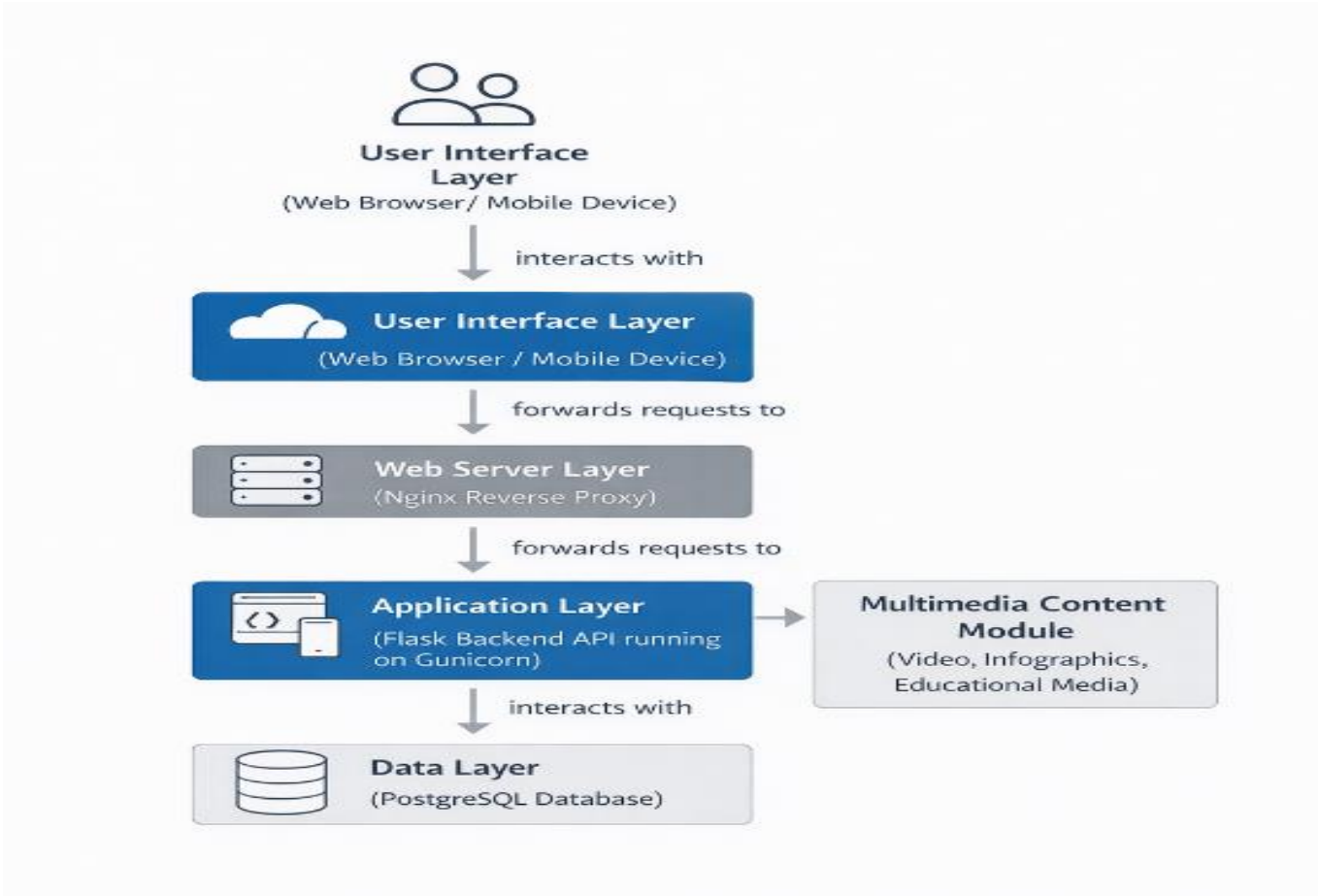

Figure 7. The software component architecture of the proposed platform illustrates the interaction between the major functional components of the system. User requests originate from web browsers or mobile devices and are processed through the Nginx web server acting as a reverse proxy. The backend application logic is implemented using the Flask framework running on the Gunicorn application server, which handles content delivery and system functionality. Persistent data storage is managed by the PostgreSQL database. The application layer also integrates a multimedia content module that provides educational videos, infographics, and other voter education resources to support interactive learning and community engagement.

System Implementation Phases

An administrative module was integrated into the system to support dynamic content management. The platform implements role-based access control (RBAC), allowing only authorized administrators to access content management features through a dedicated dashboard interface. Administrators can create and delete educational materials, ensuring that content remains accurate and up-to-date.

The system incorporates a multimedia upload mechanism, enabling administrators to directly upload video, image, and document-based content. Uploaded files are stored in categorized directories and served through the web server. Preview functionality is provided prior to submission to ensure content accuracy.

To enhance usability, the platform includes search, filtering, and pagination features that allow users to efficiently navigate and access educational materials. Input validation and error handling mechanisms were implemented on both client and server sides to maintain data integrity and system reliability.

The implementation phase demonstrates the practical realization of the system design. The integration of web server, backend application, database, and secure networking components resulted in a fully functional platform

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accessible both locally and remotely. The use of iterative development allowed continuous refinement of system features, while structured testing and evaluation ensured alignment with software quality standards.

Implementation Sub-Phases

The implementation phase was conducted in multiple stages, including environment setup, system deployment, service configuration, and integration of platform components. Each stage was validated before proceeding to the next phase to ensure system stability.

Testing and Evaluation Approach

The system was evaluated using a combination of functional testing and software quality assessment based on the ISO/IEC 25010 model. Functional testing was conducted to verify system features such as content access, multimedia playback, and API functionality.

Alpha testing was performed within the development environment to validate system configuration and component integration. Beta-level validation was simulated through real-world usage scenarios, including remote access through Cloudflare Tunnel and local access within the network.

Evaluation based on ISO/IEC 25010 focused on key quality characteristics, including functional suitability, usability, performance efficiency, reliability, security, and maintainability.

Tools and Technologies

The platform was implemented using stable and widely adopted technologies to support reliability and reproducibility. A Linux-based server operating system was used as the primary hosting environment, deployed within a virtual machine to provide isolation and ease of recovery. The web application is delivered through a standard web server, with backend services responsible for content management and basic data handling.

Multimedia elements, including videos, audio explanations, and visual infographics, were integrated to support diverse learning styles and enhance user engagement.

Deployment Strategy

Deployment was conducted within a homelab (on-premise) environment using consumer-grade hardware configured to simulate a small-scale production server. Virtualization was used to isolate the application from other workloads and to support snapshot-based recovery.

The platform supports dual access modes: local access within the hosting network and remote access via secure internet exposure, enabling flexible usage scenarios.

The deployment model follows a local–hybrid infrastructure architecture in which core services are hosted locally while secure access is provided through cloud networking services. Hybrid infrastructure models combine the reliability of on-premise systems with the accessibility of cloud based networking services (Zhang et al., 2022).

Software Quality Evaluation Framework

The evaluation of the software product was guided by the ISO/IEC 25010 Software Product Quality Model, which defines a structured framework for assessing software quality based on internationally recognized characteristics (Moumane et al., 2016). Selected quality characteristics used in this study include functional suitability, usability, performance efficiency, reliability, security, and maintainability.

Evaluation activities included functional verification of system features, observation of user interaction with multimedia content, assessment of system responsiveness during local and remote access, and review of system

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behavior under normal operating conditions. The use of ISO/IEC 25010 ensures that the assessment is systematic, transparent, and aligned with recognized software engineering standards.

Table 1. Software Quality Evaluation Based on ISO/IEC 25010

Quality Attribute	Evaluation Criteria	Method Used	Result	Interpretation
Functional Suitability	Availability of core features (content viewing, multimedia access)	Functional testing of system features	All core features operational	The system meets required functional objectives
Usability	Ease of navigation, content readability, multimedia accessibility	User interaction observation	Users able to navigate and access content	The system is user-friendly and accessible
Performance Efficiency	Response time during local and remote access	Manual testing of page load and API response	< 200 ms (local), < 500 ms (remote)	System performs efficiently under normal conditions
Reliability	System stability and uptime during operation	Continuous runtime observation	No major failures observed	System demonstrates stable behavior
Security	Protection of system from unauthorized access	Review of Cloudflare Tunnel, firewall, and access control	Secure tunnel + firewall enabled	System provides secure access architecture
Maintainability	Ease of updating and modifying system components	Code structure and modularity review	Modular architecture implemented	System is easy to maintain and extend

The system was evaluated using selected characteristics from the ISO/IEC 25010 Software Product Quality Model. Evaluation results indicate that the platform satisfies key quality attributes required for web-based information systems. Functional requirements were fully implemented, and the system demonstrated acceptable usability and performance under both local and remote access conditions. Security measures implemented through Cloudflare Tunnel and firewall configuration provided controlled system exposure, while the modular architecture supports maintainability and future system enhancements.

RESULTS AND DISCUSSION

The implementation of the VoterLab platform demonstrates the feasibility of a local–hybrid web-based architecture in supporting voter education initiatives, particularly in environments with limited or unstable internet connectivity. While the system was successfully deployed using a multi-tier architecture integrating Nginx, Flask, and PostgreSQL, the significance of the results extends beyond technical functionality toward its implications for digital civic engagement and voter awareness.

System Functionality and Architectural Implications

The successful deployment and operation of the platform confirm that a local–hybrid architecture can provide both accessibility and control over infrastructure. Unlike fully cloud-based systems, which rely heavily on continuous internet connectivity, the integration of local hosting with secure tunneling enables partial offline availability while maintaining remote access. This design is particularly relevant in the context of community-level voter education, where infrastructure limitations often restrict access to digital services. Zhang et al. (2010) emphasize that hybrid computing models improve system resilience by distributing workloads between local and remote infrastructure. This supports the observed effectiveness of the platform's local–hybrid deployment in maintaining accessibility under unstable connectivity conditions. In the context of civic technologies, such

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architectural flexibility is critical for ensuring equitable access to information, especially in rural or underserved communities.

Interface Design and User Engagement in Voter Education

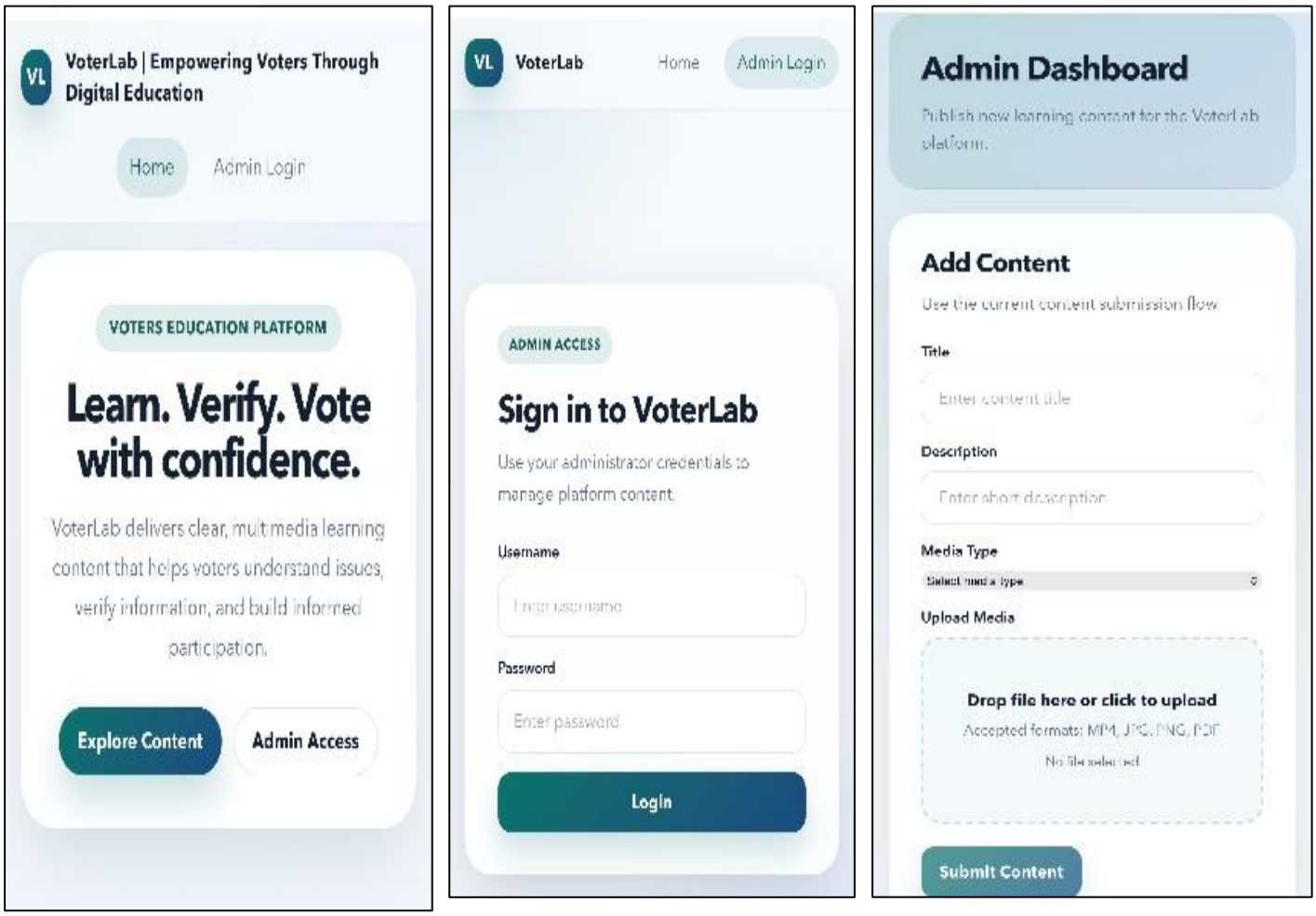

Figure 8-10. Home Page, Administrator Login Page, and Content Management Interface

The platform interface, as shown in Figures 8–10, was designed to minimize cognitive load and enhance user engagement through simplified navigation and structured content presentation. The high usability rating (4.65), as shown in Table 2, can be attributed to the platform's simplified navigation and structured content layout, which reduce cognitive load and improve accessibility for users with varying levels of digital literacy.

From a voter education perspective, usability is not merely a technical attribute but a critical factor influencing information accessibility and comprehension. Bastardo et al. (2024) emphasized the importance of conducting rigorous user-centered usability evaluations in digital civic applications, highlighting the need for systematic approaches to assess user interaction and system effectiveness. The card-based layout and guided navigation implemented in the system contribute to making complex electoral information more approachable, thereby supporting informed decision-making.

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Multimedia Learning and Knowledge Acquisition

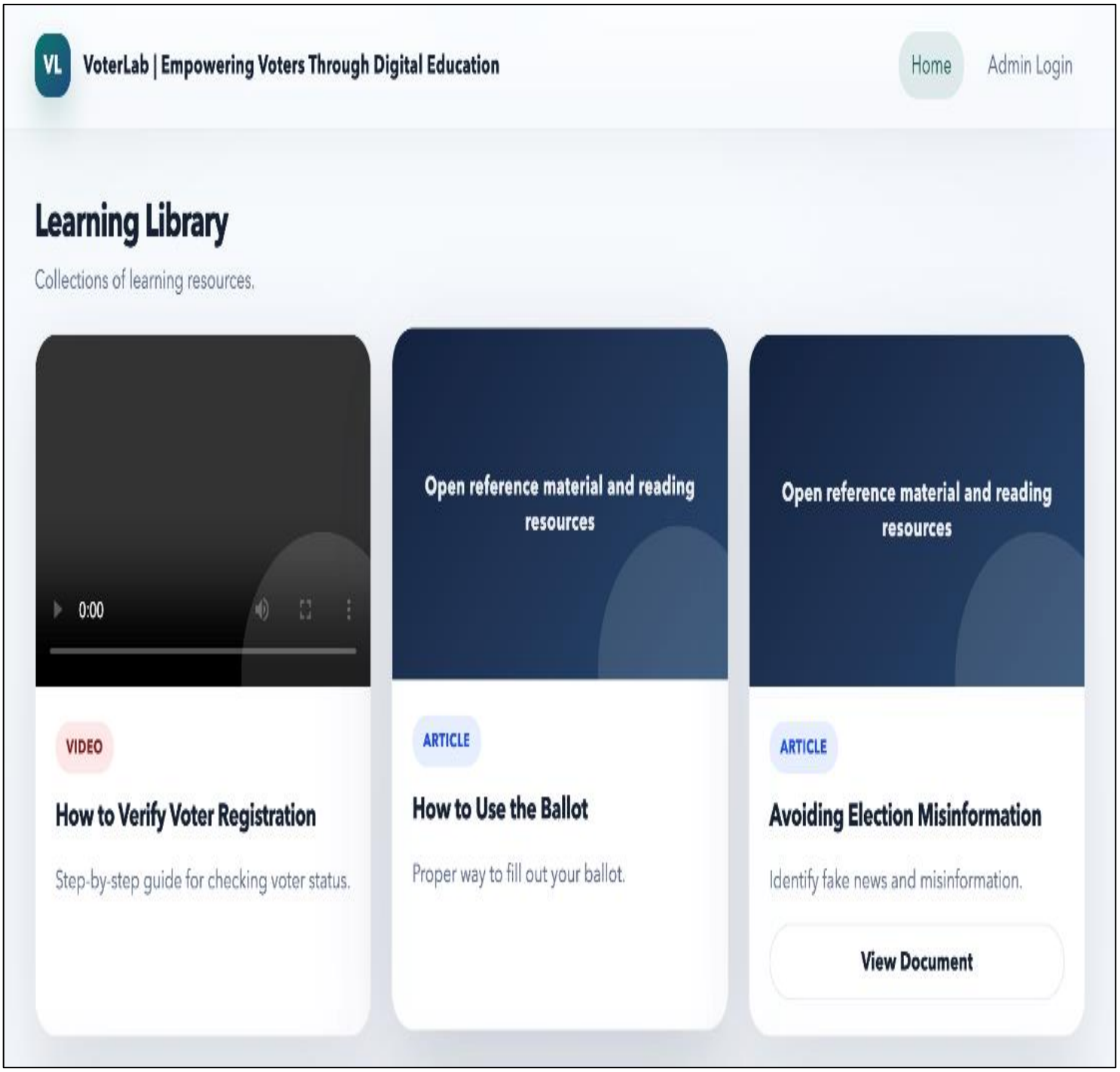

Figure 11. Multimedia Module (Learning Library)

The multimedia module (Figure 11) plays a central role in enhancing voter education outcomes by delivering content in multiple formats, including videos, infographics, and documents. The high scores in functional suitability and usability indicate that this approach effectively supports the system's educational objectives. Anggraeni et al., (2025) demonstrated that technology-based learning interventions incorporating interactive features significantly improve political knowledge, critical thinking, and civic engagement among users.

Furthermore, digital voter education has been shown to positively influence voter confidence and participation (Suttmann-Lea, 2023). By providing structured and engaging learning materials, the platform contributes to reducing informational barriers and promoting more informed civic participation.

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Content Management and Information Trustworthiness

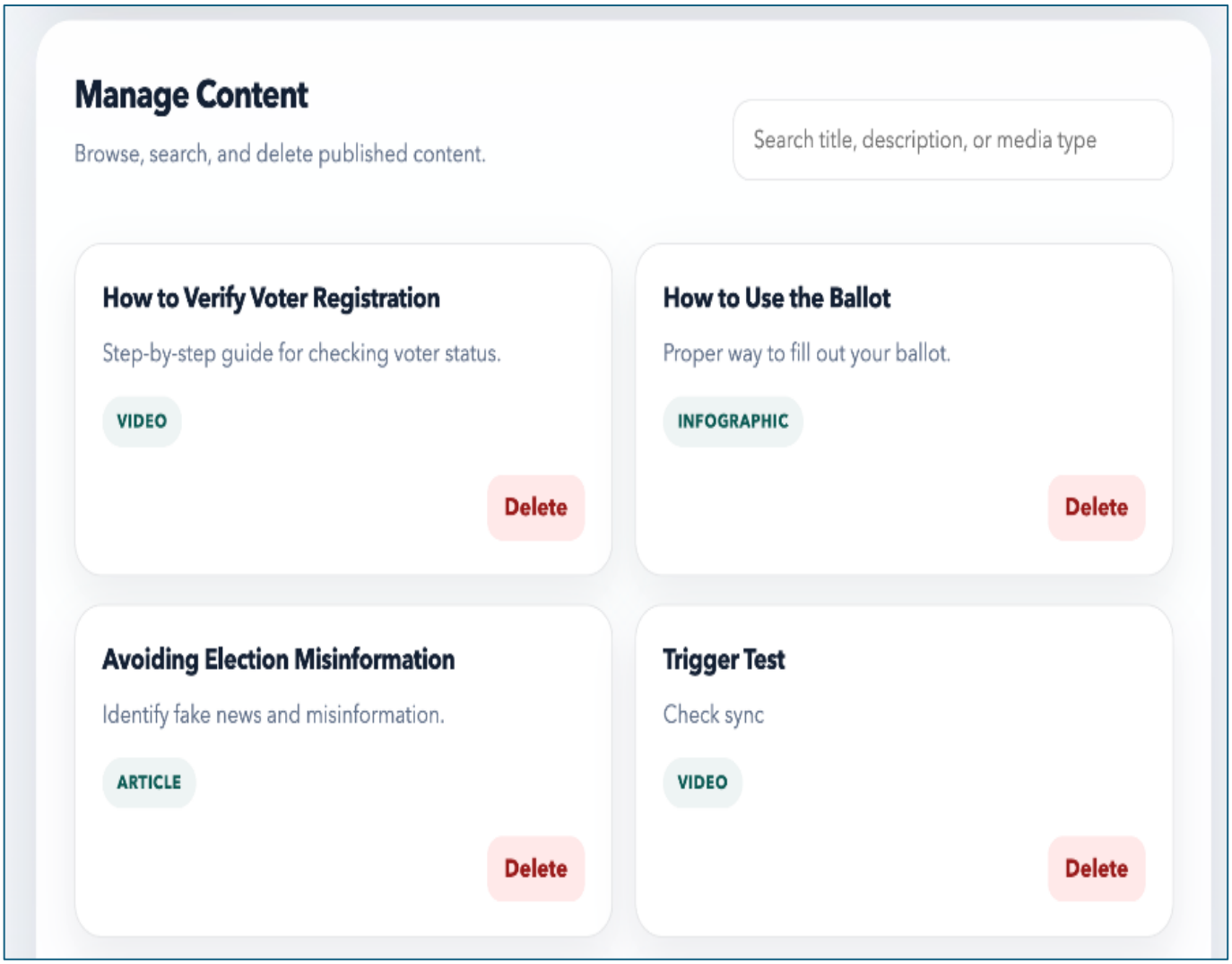

Figure 12. Administrative Dashboard to manage multimedia content

The integration of an administrative dashboard with role-based access control ensures that content is curated and maintained by authorized users. This feature is essential in voter education systems, where the accuracy and timeliness of information directly influence public trust.

The ability to dynamically update content allows the platform to respond to evolving electoral processes and emerging challenges such as misinformation. Diepeveen and Pinet (2022) highlighted that access to reliable and curated information is essential in countering misinformation, reinforcing the importance of the platform's controlled content management system.

Interpretation of ISO/IEC 25010 Evaluation Results

Table 2. ISO/IEC 25010 Evaluation Results

Quality Attribute	Mean Score	Interpretation
Functional Suitability	4.78	Excellent
Usability	4.65	Excellent
Performance Efficiency	4.60	Excellent
Reliability	4.52	Very Good
Security	4.70	Excellent
Maintainability	4.68	Excellent

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The ISO/IEC 25010 evaluation results demonstrate that the system performs strongly across key quality attributes, with excellent ratings in functional suitability (4.78), usability (4.65), performance efficiency (4.60), security (4.70), and maintainability (4.68), while reliability (4.52) was rated very good.

The high functional suitability score indicates that the system effectively implements its intended features. This finding is consistent with the application of ISO/IEC 25010 in evaluating system quality, as demonstrated by Hussain and Mkpojiogu (2015), who used the model to assess quality-in-use in a web-based system. The strong usability rating reflects the effectiveness of user-centered design principles, particularly in reducing interface complexity for diverse user groups, a factor identified as critical in public-facing systems.

The slightly lower reliability score may be attributed to the dependency on local infrastructure, where hardware limitations and network variability can affect system stability. This highlights a key trade-off in the local–hybrid model: while it enhances accessibility and control, it may introduce challenges in ensuring consistent uptime compared to fully managed cloud environments.

Comparison with Existing Systems

Compared to existing voter education platforms, which are predominantly cloud-based and centrally managed, the proposed system introduces a localized deployment model that enhances accessibility in low-connectivity environments. This approach addresses a key limitation of traditional platforms, which often assume stable internet access.

Additionally, while many existing systems rely on static information delivery, the integration of multimedia content and dynamic content management in the proposed platform provides a more interactive and adaptable user experience. Shin et al. (2024) highlight key limitations in digital participation tools, particularly in the dissemination of accountability information and transparency in policymaking processes. While their study focuses on informational gaps, the proposed system complements these findings by addressing accessibility and content delivery challenges through a local–hybrid deployment approach.

Scalability, Sustainability, and Security Considerations

The modular architecture supports scalability by allowing independent expansion of system components; however, the reliance on local hardware may limit performance under high user demand without additional infrastructure investment.

From a sustainability perspective, the use of open-source technologies reduces operational costs and supports long-term maintainability. This is particularly relevant for community-based deployments where resources may be limited.

Security is addressed through HTTPS encryption, firewall configurations, and controlled exposure via Cloudflare Tunnel, reducing the system's attack surface. These measures align with general cybersecurity principles related to confidentiality, integrity, and availability in networked systems (Ferrag et al., 2020). Future enhancements such as multi-factor authentication and audit logging are recommended to further strengthen system security.

In addition to technical security, the system also faces a content management consideration, as role-based access control alone does not fully mitigate the risk of biased or selectively framed educational content being introduced by authorized administrators. While the system restricts access to trusted users, future iterations may require additional safeguards such as content review workflows, moderation layers, or verification mechanisms to ensure informational neutrality and integrity.

Limitations and Future Work

Despite its promising results, the study is limited by the absence of large-scale user testing and empirical measurement of learning outcomes, which restricts the ability to fully assess the system's impact on voter

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knowledge and behavior. Future work should include pilot deployments in real community settings to evaluate user engagement, knowledge acquisition, and system usability in practice. Such studies would provide stronger evidence of the platform's effectiveness in improving voter awareness and participation.

In addition, while the system implements role-based access control to restrict content management to authorized administrators, it does not fully eliminate the risk of biased or selectively framed educational content being introduced by privileged users. This represents a limitation in terms of content governance, as the platform currently relies on administrative accountability rather than structured validation or review mechanisms. Future enhancements may incorporate multi-level content review workflows, moderation mechanisms, or integration with verified information sources to ensure neutrality, accuracy, and trustworthiness of voter education materials.

Synthesis and Contribution

Overall, the findings demonstrate that the proposed system provides a practical and scalable solution for voter education, particularly in resource-constrained environments. The integration of a local–hybrid architecture, multimedia learning, and dynamic content management distinguishes the platform from traditional web-based systems. More importantly, the system contributes to digital civic engagement by addressing accessibility and information reliability challenges through a localized deployment model and structured multimedia content delivery. These findings reinforce the potential of hybrid web-based architectures as a viable approach for delivering inclusive, scalable, and secure voter education solutions in resource-constrained environments.

CONCLUSION

This study aimed to design, implement, and evaluate a local–hybrid web-based voter education awareness platform that addresses accessibility challenges in community environments. The findings demonstrate that the proposed system effectively delivers structured and multimedia-driven voter education content while maintaining strong performance across key ISO/IEC 25010 quality attributes, including functional suitability, usability, security, and maintainability.

The results demonstrate the practical value of integrating local–hybrid infrastructure with multimedia learning and controlled content management to enhance accessibility and engagement in voter education. This approach enables reliable content delivery, supports diverse learning preferences, and ensures that educational materials remain accurate and up-to-date through controlled administrative access. As a result, the system provides a more accessible and engaging platform for voter education compared to traditional static or fully cloud-based solutions.

The primary contribution of this study lies in demonstrating that hybrid web-based architectures can effectively support digital civic engagement, particularly in resource-constrained environments. The platform offers a viable solution for barangay-level deployment, where internet connectivity may be limited but the need for reliable voter education remains critical. By improving access to structured and trustworthy information, the system has the potential to support more informed and confident participation in democratic processes.

Future work may include pilot deployment in real community settings, integration with official election data sources, and further evaluation of user engagement and learning outcomes. These enhancements would provide deeper insights into the system's long-term effectiveness and scalability as a community-based voter education platform.

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