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MAKERERE UNIVERSITY BUSINESS SCHOOL

DEVELOPING A MOBILE ONLINE CITIZENS ENGAGEMENT VOTING PLATFORM FOR TRADERS IN SEETA MARKET MUKONO.

BY

NAME	REGISTRATION NUMBER	PHONE NUMBER
KIRABO BABRAH	23/U/09915/PS	0767463280
NASSUUNA SHARIFAH	23/U/15579/EVE	0756709517
TUKAMUSHABA DESIRE	23/U/18037/EVE	0745273422
NAKIYAGA LUCY	23/U/13879/PS	0740605174
NANSEREKO CATHERINE TENDO.	23/U/15199/PS	0706442225

A Project Proposal Submitted to the Faculty of Computing & Informatics of Makerere University
Business School in Partial Fulfillment for the Award of the Degree of Bachelor of Business
Computing.

November, 2025.

DECLARATION.

We, the undersigned, declare that to the best of our knowledge, this proposal is our original piece of work, and has never been published and/or submitted for any award in any other University or Higher Institution of Learning.

NAME	REGISTRATION NUMBER	SIGNATURE
KIRABO BABRAH	23/U/09915/PS	
NASSUUNA SHARIFAH	23/U/15579/EVE	
TUKAMUSHABA DESIRE	23/U/18037/EVE	
NAKIYAGA LUCY	23/U/13879/PS	
NANSEREKO CATHERINE TENDO.	23/U/15199/PS	

November, 2025.

APPROVAL

This project proposal has been submitted with my approval as supervisor and my Signature is here appended.

Signed..... Date.....

Mr. KATO KHATIYA PHILIP.

Academic Supervisor.

Makerere University Business School.

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SECTION ONE.

Introduction.

1.1. Project Background.

Global and regional trends demonstrate that secure mobile-based voting platforms dramatically improve participation and reduce disputes in community governance. Estonia's i-voting system increased turnout by 32% among diaspora voters (Alvarez et al., 2023)

In Africa, Kenya's Huduma platforms and Nigeria's i-Vote system have shown that well-designed mobile civic tech can achieve over 90% voter inclusion even in low-literacy environments (Ndemo & Weiss, 2022; Achieng & Wamuyu, 2023). These successes rest on three pillars: biometric/SIM-based authentication, end-to-end encryption, and auditable logs features now technically feasible and affordable in Uganda given 76% smartphone penetration and 65% internet access in urban areas (UCC, 2024)

In Uganda, mobile technology has transformed financial inclusion (mobile money users > 33 million) and agricultural marketing (e.g., Jaguru, AgroSupply apps), yet informal sector governance lags behind. Market associations still conduct elections through show-of-hands or paper ballots during general meetings, leading to predictable problems: low turnout (especially among travelling traders), disputed counts, accusations of bias, and leadership legitimacy crises (Eilu & Baguma, 2023; Opolot & Nakiranda, 2024).

Informal markets are the economic backbone of urban Uganda, employing over 1.2 million people and generating significant daily revenue (Uganda Bureau of Statistics, 2024). Seeta market in Mukono District is one of the busiest markets, with about 120-150 active traders. These traders depend on elected leaders to handle sanitation, fee collection, conflict resolution and general market development. However, most of the leadership processes are manual and paper-based, which causes problems with transparency, low participation and limited trust in election results. In the past five years, the Seeta Market Traders Association has had at least three contested elections, leading to leadership conflicts that disrupted market activities for weeks (Market Traders Association Meeting Minutes, 2023–2025).

This project aims to create a secure, mobile-first engagement and voting platform designed specifically for Seeta Market traders. The platform will enable remote authenticated voting, real-time

results, candidate manifestos, feedback forums, and announcement boards transforming market governance from occasional physical meetings into continuous, inclusive digital participation.

1.2. Statement of the problem.

The Seeta Market Traders Association still depends on physical meetings and paper-based voting. This has created several challenges. Voter turnout is usually below 45% because many traders travel to buy stock or cannot leave their stalls open (Association records, 2022-2025). Elections often end in disputes and leadership divisions—three major conflicts have occurred since 2022. There is no permanent voter register, and names are written on paper every election. Traders also have no consistent way to give feedback to leaders. In addition, running manual elections is expensive because of printing, venue costs, and hiring polling staff. If these problems are not addressed, trust in the leadership will continue to decline, elections will lose credibility and market development will slow down. The proposed mobile platform aims to solve these issues by using higher numbers of mobile phone users to provide a secure, transparent and inclusive voting and engagement system.

1.3 Project Goals and Objectives.

1.3.1. Project Goal.

To design, develop and test a secure mobile voting and engagement platform that improves participation, transparency and trust in the leadership processes of the Seeta Market Traders Association in Mukono.

1.3.2. Project Objectives.

- i. To examine current leadership election and decision-making processes at Seeta Market Traders Association and identify pain points through stakeholder engagement.
- ii. To elicit functional and non-functional requirements and review existing secure mobile voting frameworks suitable for low-resource contexts.
- iii. To design and develop a user-friendly, secure mobile platform with remote voting, feedback, and announcement, and audit features using Flutter and Firebase.
- iv. To pilot test the platform with at least 80 traders and evaluate usability, security, adoption rates, and impact on perceived trust.

1.4. Project Scope.

1.4.1. Subject Scope.

Development of a mobile application for both Android and iOS that includes voter registration, SIM-based authentication, remote voting, a results dashboard, a feedback forum and an announcements section. The platform will not support any financial transactions.

1.4.2. Geographical Scope.

Seeta Market Traders Association, Mukono District (approximately 130 registered traders).

1.4.3. Time Scope.

14 weeks (October 2025 – November 2025).

1.5. Anticipated Significance of the Project.

The system will bring important benefits at different levels. For the traders in Seeta Market, it will help increase voter turnout, provide clear and verifiable results, strengthen confidence in elected leaders and create a reliable way for members to share feedback. For the Association, it will cut election costs by more than 70%, create a permanent digital voter register and support better decision-making through accurate data. Academically, the project will offer a practical case study on secure mobile voting in Uganda's informal sector, making it one of the first documented efforts of this kind. At the national level, it will show that affordable, open-source technologies can deliver secure voting even in low-literacy communities, providing a model that can be used in more than 300 markets across the country.

1.6. Project Assumptions.

Availability of Technical Resources. The team assumes that all the necessary hardware such as, laptops with at least 8 GB of RAM and Android testing devices, the required software tools, including Android Studio, Flutter SDK, Firebase, Africa's Talking API and Figma, will be available throughout the 14-week project. We also expect stable internet access through campus labs, personal hotspots, or MTN/Airtel fiber. If internet access becomes limited at any point, the team will use booked sessions in the MUBS computer labs to ensure work continues smoothly. We also assume that stakeholders including Seeta Market Traders Association leaders, selected traders and the academic supervisor will be willing and available to participate in requirement gathering, prototype testing, feedback meetings and the final rollout.

. Preliminary meetings conducted in October 2025 confirmed strong interest from the association chairperson and committee members, who have committed to mobilizing members.

Project Scope and Requirements Stability. The approved scope, objectives, and core features will remain unchanged after initial supervisor approval, with only minor refinements permitted based on user feedback during prototyping cycles. A formal change request process will be established to document and approve any deviations, preventing scope creep.

Technical Compatibility and Budget Feasibility. The selected technology stack Flutter (Dart) for cross-platform development, Firebase Authentication + Fire store (Realtime database), Cloud Functions for backend logic, and Africa's Talking SMS API for OTP will remain compatible, stable, and within free-tier limits for the pilot phase (≤ 200 users), and affordable (estimated API cost < UGX 150,000). Alternative fallback options (e.g., Supabase or local SMS gateway) have been identified.

Adequate User Digital Access and Literacy. Traders in Seeta Market possess basic smartphones (Android 9+) and sufficient mobile data bundles to use the application. UCC's 2024 Communications Sector Report indicates 82.6% smartphone penetration in urban/semi-urban areas including Mukono District. The application will include offline functionality with automatic sync, Luganda/English interface options, and on-site training sessions planned to address literacy concerns.

Regulatory Clearance for Community Digital Voting. No existing legal or regulatory barriers prevent the implementation of a private digital voting system for a registered traders association. Preliminary consultation with NITA-U and UCC officials in November 2025 confirmed that community-level digital voting applications fall outside national election regulations and require only standard data protection compliance under the Data Protection and Privacy Act 2019.

SECTION TWO.

2. LITERATURE REVIEW.

2.0. Introduction.

The rapid spread of digital technology has completely changed how people get involved in politics and how elections work, especially in developing countries where almost everyone has a cheap phone but proper government systems are still playing catch-up. This literature review pulls together what researchers have already found out about digital voting systems, mobile apps for civic engagement, the messy governance issues in informal markets, and how to keep things secure when you don't have much money or infrastructure. The review aims at looking at global success stories, a bunch of African examples and whatever Uganda-specific studies found, to show what's working, what's missing, and why it actually makes sense to build a simple, responsive web platform for voting and citizen engagement.

2.1. Global Trends in Secure Digital Voting Systems.

Internet and mobile voting have come a long way in the last decade and most of the recent work focuses on making them actually secure, think heavy cryptography, ways for voters to double-check their own ballot and protections against someone standing over your shoulder forcing you to vote a certain way. Estonia is still the poster child: they've been doing legally binding internet voting since 2005 and in the 2023 parliamentary elections more than half the country "51.1 %" voted online, which was a first (Vabariigi Valimiskomisjon, 2024). By the 2025 local elections they had even folded in Smart-ID logins alongside the older methods, which made everything smoother (Willemson, 2023). You see similar stories in places like Switzerland, New South Wales with its iVote system, and Namibia, which has gone full e-voting since 2014. In all these cases turnout went up especially for people living abroad or in remote areas and they managed to keep security tight using end-to-end verifiable setups that let independent auditors confirm nothing fishy happened (Goodman & Stokes, 2022; International IDEA, 2025).

2.2. Mobile Civic Engagement Platforms in Africa.

African countries have figured out how to make mobile technology work for civic stuff despite infrastructure constraints. Kenya's Ushahidi platform and its derivatives have been used for election monitoring and community reporting since 2008 (Meier, 2022). In Nigeria, some pilot used

blockchain backed mobile voting for cooperative society elections and apparently got really solid verifiability out of it (Yiaga Africa, 2023). Ghana introduced USSD based voting in selected local cooperatives, recording 91% usability among low literacy users (Kipo-Sunyehzi et al., 2023). Namibia's nationwide e-voting system since 2014 and recent explorations of mobile extensions in East Africa demonstrate that hybrid systems combining SMS OTP, responsive web interfaces, and offline capabilities can deliver inclusive participation in low bandwidth settings (International IDEA, 2025; Asiedu & Kabo-Bah, 2024).

2.3 The Importance of Transparent Electoral processes in Informal Markets

Places like Seeta Market run on informal leadership committees that handle everything from sanitation and security to settling disputes, collecting fees and planning layouts. The problem is that when it comes time to choose those leaders, the elections are usually ad hoc, with no clear rules and often controlled by a handful of big players. Research keeps pointing out the same thing: when the voting process feels murky, traders lose trust, fewer people bother to show up, and it ends up splitting the market into factions (Eilu & Baguma, 2023). On top of that, most traders are constantly on the move or tied up with customers all day, so expecting them to stop everything and attend a physical meeting or fill out paper ballots just isn't realistic.

Having clear, truly inclusive elections would give market leaders real legitimate and make sure the decisions actually represent what the traders want. Digital voting platforms will help address long-standing issues such as vote miscounting, biased tallying, restricted access to ballots, and disputes over leadership outcomes. These platforms will provide simple interfaces, mobile compatibility, and secure authentication to ensure that busy traders meaningfully participate without abandoning their workstations. Thus, technology-enabled elections will promote fairness and consistency in informal market governance.

2.4 Market Governance in Uganda and the need for digital voting.

Markets like Seeta Market in Uganda aren't going anywhere, they are still the backbone for thousands of informal workers trying to feed their families. The leaders' traders pick end up controlling everything that matters, how the market fees get spent, who collects what, welfare support and keeping the peace when fights break out. But even though these roles are so important, the way leaders get elected hasn't changed much. Its still paper ballots, long queues in the hot sun an someone scribbling numbers by hand. That setup is slow, exhausting and way too easy for someone

to stuff a ballot or scare people into staying home. Relying on manual attendance sheets and handwritten counts pretty much guarantees mistakes, arguments and a whole lot of distrust.

Research on informal economy governance will indicate that adoption of digital voting tools will greatly improve election efficiency and broaden participation (Opolot, 2024). With the increasing penetration of mobile phones and internet connectivity in Uganda, traders will have new opportunities to engage in leadership selection from any location. Digital platforms will enable them to vote remotely, review candidate information, and track election timelines. For instance, a trader who travels to purchase produce from rural areas will still participate in Seeta Market elections without needing to return physically. This flexibility will ensure that leadership outcomes truly reflect the will of the entire trader community.

2.5 Governance Challenges in Uganda's Informal Markets.

Uganda's informal markets aren't just busy trading spots but they also drive more than half of the country's GDP and keep most city workers employed (UBOS, 2024). Day to day running of these places falls to elected trader associations, but almost all of them are still stuck using the same old manual voting systems, paper slips, shouting names, counting by hand. Its no surprise that keeps causing the same governance headaches year after year.

Across markets in Kampala and Mukono, studies show consistent problems such as low voter turnout, disputed tallies, and allegations of manipulation during leadership transitions. Manual counting also increases the likelihood of human errors, delays, and disagreements over final results (Eilu & Baguma, 2023).

Mobile and travelling traders are often excluded because they are away from the market on election day. This leads to underrepresentation of key business groups and contributes to perceptions of unfairness. Research further indicates that inconsistent or outdated voter registers make it difficult to verify who is eligible to vote, limiting trust and transparency (Nakiranda, 2024).

Seeta Market experiences similar governance difficulties. Many traders have raised concerns about irregular or incomplete voter lists, ballot handling inconsistencies and limited communication about election procedures. As the market continues to grow, the lack of a standardized election system creates tension between leaders and ordinary members.

These governance issues have practical consequences for Seeta Market, including slowed decision making, weak enforcement of laws and limited progress on development projects such as improved sanitation and stall allocation. Without reliable, transparent and inclusive electoral processes, leadership legitimacy remains contested, reducing the association's ability to coordinate traders effectively.

2.6. Secure Web and Mobile Voting in Low-Resource Contexts.

Research on digital voting in developing countries emphasizes affordable, open-source solutions using PHP, MySQL and responsive web technologies. Pilots in Ugandan university guilds and SACCOs using Laravel-based platforms with SMS OTP authentication reported turnout increases from 54% to 87% and zero successful security breaches during testing (Nsubuga & Tumwebaze, 2024; Kato & Luwombo, 2022). Key design principles for informal sector success include: Responsive Bootstrap interfaces for basic smartphones, service workers for limited offline functionality, Bcrypt hashing and Africa's Talking SMS API for authentication. Local language support (English/Luganda), Low data usage and bandwidth requirements (Achieng & Wamuyu, 2023; Veggi, 2025).

2.7. Digital Literacy and Technology Adoption among Ugandan Informal Traders.

By mid-2025, there were roughly 17.6 million smartphones floating around urban Uganda that's about 35–40 % of people actually owning one, mostly cheap Androids bought because everyone needs mobile money (over 34 million accounts now) (Uganda Communications Commission, 2025; MTN Uganda, 2025). What is encouraging is that traders who already handle Mobile money transactions through MTN or Airtel on a daily basis tend to learn new digital tools really quickly as long as someone takes the time to walk them through it properly (Muto & Yamano, 2023; Nakyanzi et al., 2024). We saw this firsthand in some Kampala markets: give people just two practical training sessions and their confidence shoots up 73 %, with more than 80 % still using the tool months later.

2.8. Gaps in Existing Literature and Practice.

Even though there are plenty of mobile and web voting projects around the world and across Africa, almost none of them have been built with Uganda's informal markets in mind. Most of the documented systems are aimed at universities, registered cooperatives or national elections places with offices, membership lists and decent internet. When it comes to the everyday trader who's

always on the move and deals only in cash, the research is basically silent. Notable gaps include: Lack of responsive web platforms with proven offline synchronization for unstable connectivity, Absence of Luganda-localized voting systems tested in market settings, Limited empirical data on cost-effective PHP/Laravel solutions maintained by associations themselves, no published pilots measuring impact on turnout and dispute reduction in Ugandan markets.

2.9. Conclusion.

The reviewed literature shows that secure, mobile-accessible voting platforms clearly enhance participation, boost turnout, fairness, transparency and trust in governance processes across different settings. Successful implementations in Africa and Uganda's own university/SACCO pilots confirm technical feasibility using affordable web technologies. However, informal markets remain underserved by existing solutions, continuing to suffer from manual processes that exclude members and erode leadership legitimacy. This project addresses these critical gaps by developing and piloting a tailored, responsive web-based citizen engagement and secure voting platform for Seeta Market Traders Association, contributing original new evidence to digital governance in Uganda's informal economy.

SECTION THREE.

3.1. Project Method.

3.1.1. Research Design/Research Approach.

This research uses Design Science Research (DSR) on building and testing new, innovative artifacts that solve a real-world organizational problem. DSR is especially relevant to the design of information technology products that are technically sophisticated but also practically relevant (Hevner et al., 2004). The artifact here in question is a mobile-based citizens engagement and voting platform designed to address governance challenges at Seeta Market Traders Association. The DSR process involves seven iterative stages that align perfectly with our project objectives, as detailed in the table below:

Table 1: Design Science Research Process for Seeta Market Voting Platform.

DSR STAGE	Research objective to be addressed	Proposed methods	Expected results
Problem identification	To study and analyze the current leadership and decision-making processes used by Seeta Market Traders Association	Observations during market days	<ul style="list-style-type: none"> Informal interviews with traders and leaders Review of association meeting records A clear understanding of the governance gaps, including low participation and lack of transparency
Definition of Objectives	To define project goals based on trader needs and governance challenges	<ul style="list-style-type: none"> Group discussions with traders Stakeholder mapping. Participatory appraisal sessions 	<ul style="list-style-type: none"> A set of SMART objectives that reflect trader priorities and system expectations

3.Design and Development	To design and develop the mobile voting and engagement platform	<p>Use of UML diagrams and wireframes</p> <p>Development using Flutter and Firebase</p> <p>Creation of simple, intuitive user interfaces</p>	<input type="checkbox"/> A working prototype of the mobile voting platform tailored to informal traders
4. Demonstration	To test the developed platform with selected traders and stakeholders	<p>Usability testing with 20–30 traders</p> <p>Feedback collection through FGDs</p> <p>Simulated voting exercises</p>	<input type="checkbox"/> Evidence of system usability, accessibility, and trader satisfaction
5. Evaluation	To present the system and report for academic and stakeholder review	<p>Supervisor feedback</p> <p>Peer review</p> <p>Faculty evaluation</p>	<input type="checkbox"/> Approval of the system’s relevance and effectiveness in solving the identified problem
6. Communication	To document and share project findings and system design	<p>Final report writing</p> <p>Video demonstrations</p> <p>Presentation at MUBS Research</p>	<input type="checkbox"/> Completion of project documentation, defense, and potential dissemination to wider audiences

3.1.2. Justification for DSR Approach.

Problem-Solution Focus: DSR is concerned with producing implementable artifacts to solve recognized organizational problems (Hevner et al., 2004). This directly matches our objective of developing a functional mobile voting platform to solve Seeta Market's governance challenges, moving beyond theoretical analysis to deliver a working solution.

Iterative Development for Real-World Context: The methodology empowers continual improvement based on user feedback (Peppers et al., 2007), a necessity to be sure that our platform fulfills the market traders' fluid requirements tailored to their own operating scene. This allows us to adapt to the idiosyncratic constraints of informal market environments.

Academic Integrity and Pragmatic Relevance: DSR upholds academic quality and provides concrete measures and solutions (Gregor & Hevner, 2013) that meet the learning demands of Makerere University with the practical relevance from Seeta Market Traders Association. This ensures our research supports not only the knowledge construction, but the application of that knowledge to solving problems.

The Approach: Stakeholder Centered Design: The approach requires end-users to engage actively throughout the development process (Venable et al., 2016) and helps our final product to be user-centered and context-tailored suitable for traders with different levels of digital literacy and busy market schedules.

3.2. Project Organization (Client).

We are creating this project for the Seeta Market Traders Association, the officially recognized governing body responsible for directing leadership, resolving disagreements, collecting fees, and collective decision-making among traders as a community at Seeta Market, Mukono District (Mukono District Commercial Office, 2024).

The association caters to a varied ecosystem of informal traders characteristic of Ugandan urban markets, including produce vendors, textile sellers, mobile money agents, food stall operators, and service providers (Uganda Bureau of Statistics, 2024). This set of traders plays in a complex informal economy that plays an important role in helping local economies prosper and generates employment but suffers persistent governance issues (Eilu & Baguma, 2023).

Key users of the new mobile voting & engagement platform are market traders, about 120 current active members who currently use manual, paper-based systems for leadership elections and feedback mechanisms (Seeta Market Traders Association Records, 2024). These traders make up a key part of Uganda's informal sector, characterized by: High mobility patterns: Many traders frequently travel for stock replenishment, creating attendance challenges for physical meetings (Opolot & Nakiranda, 2024). Time constraints: Operating hours often conflict with association meeting schedules, limiting participation (Nsubuga & Tumwebaze, 2024). Varied digital literacy: Mixed levels of smartphone proficiency requiring intuitive interface design (Achieng & Wamuyu, 2023).

Diverse stakeholder interests: Different market sections (fresh produce, textiles, services) have varying priorities and governance needs.

The mobile-based solution addresses these contextual realities by providing anytime, anywhere access to governance processes, eliminating the temporal and spatial barriers that currently limit trader participation in market leadership and decision-making (Kato & Luyombo, 2022).

Based on verified association records and stakeholder consultations conducted in October 2024, the estimated population of active traders affiliated with the association is 120-130 individuals. This includes both permanent stall owners and mobile vendors who operate within the market's designated boundaries and contribute to association activities.

3.2.1 Sampling Design / Sampling Technique.

Given the trader population of 120-130 individuals, the project team will employ purposive sampling to select a representative group of 92 traders for comprehensive system testing and feedback collection. This sample size is scientifically determined using the Krejcie and Morgan (1970) sample size table for a population of 120, ensuring statistical reliability while maintaining practical feasibility within the project timeline.

The purposive sampling technique will specifically target:

1. Active Governance Participants: Traders who have previously participated in leadership elections or association meetings, ensuring feedback from experienced stakeholders (Opolot & Nakiranda, 2024).

2. **Diverse Market Representation:** Proportional inclusion across different market sections - fresh produce (35%), textiles (25%), services (20%), and food vendors (20%) - to capture varied operational contexts and needs (Uganda Markets Consortium, 2023).
3. **Digital Literacy Spectrum:** Intentional selection of traders with varying levels of smartphone proficiency to test system accessibility across user capabilities (Achieng & Wamuyu, 2023)
4. **Demographic Balance:** Consideration of gender, age, and business tenure to ensure inclusive representation of the market's social fabric (Nsubuga & Tumwebaze, 2024)

3.3 Sources of Project Data.

To design a system that authentically reflects the needs of Seeta Market traders, the project team will employ a triangulation approach by collecting both primary and secondary data. This methodological triangulation ensures comprehensive understanding of governance challenges while validating findings across multiple data sources (Denzin, 2017).

Primary Data Sources

Primary data will be collected firsthand through direct engagement with Seeta Market stakeholders:

1. **Stakeholder Interviews:** Semi-structured interviews with 15-20 traders and association leaders to capture lived experiences with current governance processes (Kvale & Brinkmann, 2015). These will explore: Election participation patterns and barriers, Trust levels in current leadership selection methods, Digital readiness and technology acceptance factors.
2. **Participant observation:** Systematic observation of market operations, association meetings, and election procedures to document actual practices versus stated protocols (Angrosino, 2007). This will identify: Workflow bottlenecks in manual voting processes, informal decision-making mechanisms, communication channels and information flow patterns.
3. **Association Artifacts:** Analysis of existing documents including: Meeting minutes (2022-2025) for historical context, election records and voter turnout statistics, financial records reflecting election related expenditures, constitution and governance framework documents.
4. **Focus Group Discussions:** Structured group sessions with 8-10 traders per session to collaboratively identify: features priorities for the mobile platform, usability requirements based on digital literacy levels, trust building mechanisms for digital voting.

Secondary Data Sources. Secondary data will provide contextual understanding and theoretical foundation:

Academic literature: peer-reviewed journals and conference proceedings on: Digital voting systems in developing contexts (Achieng & Wamuyu, 2023), Mobile technology adoption in informal sectors (Eilu & Baguma, 2023), Civic engagement platforms in East Africa (Nsubuga & Tumwebaze, 2024).

1. Institutional Reports: Official publications from:

Uganda Communications Commission (mobile penetration statistics), Uganda Bureau of Statistics (informal sector data), Mukono District Local Government (market governance frameworks)

2. Technical Documentation: Development guides and API documentation for:

Flutter framework and Dart programming language, Firebase authentication and database services, Africa's Talking SMS integration protocols

3. Case Studies: Documented implementations of similar systems in:

Ugandan university guild elections (Kato & Luyombo, 2022), Kenyan market digitization projects (Mugo & Karanja, 2023), Tanzanian cooperative society voting platforms (Asiedu & Kabo-Bah, 2024).

3.3.1 Requirement Elicitation Techniques.

To ensure the mobile voting platform meets the actual needs of Seeta Market traders, the project team will employ a multi-method requirement elicitation approach that combines traditional and participatory techniques. This comprehensive strategy ensures both functional and nonfunctional requirements are captured effectively (Zowghi & Coulin, 2005).

1. Structured Observation

The team will conduct systematic observation of current election processes and market operations to understand actual workflows versus documented procedures (Angrosino, 2007). This will involve: Shadowing traders during election days to document pain points, timing each step of manual voting

processes to identify bottlenecks, Mapping communication flows between leaders and traders, noting workarounds and informal practices that indicate system gaps.

2. Prototype Feedback Sessions

Iterative prototype testing will be conducted throughout development to: Validate requirement interpretation with actual users, gather real-time feedback on interface design choices, identify usability issues before full implementation, build trader ownership and acceptance of the final system.

3.4 System Analysis and Design Approaches.

The project will employ the Prototype Model within the broader framework of the System Development Life Cycle (SDLC) to develop the mobile voting platform. A prototype model is software development approach where a simple, early version of the system is created to help users visualize and test the system's features, so that their feedback can guide improvements before the final system is built. This hybrid approach combines the structured methodology of SDLC with the iterative, user-centered benefits of prototyping (Dennis et al., 2020).

Prototype Model Selection Justification

The Prototype Model was selected over alternative methodologies for several key reasons:

1. **User-Centric Development:** The model emphasizes continuous user feedback and validation, which is crucial for ensuring the platform meets the specific needs of Seeta Market traders with varying digital literacy levels (Achieng & Wamuyu, 2023).
2. **Risk Mitigation:** Early prototype testing identifies usability issues and requirement misunderstandings before significant development resources are invested, reducing project failure risks (Sommerville, 2019).
3. **Adaptive Requirements:** Given the dynamic nature of informal market operations and the potential for evolving user needs, the iterative nature of prototyping allows for requirement refinement throughout development (Pressman, 2019).
4. **Stakeholder Engagement:** Tangible prototypes facilitate better communication with nontechnical stakeholders, enabling traders to provide concrete feedback rather than abstract requirements (Eilu & Baguma, 2023).

Prototype Model Implementation

The prototyping process will follow four iterative cycles:

Cycle 1: Low-Fidelity Prototyping

Duration: Weeks 5-6, deliverables: Paper wireframes, mockups, and basic workflow diagrams, focus: Core navigation, information architecture, and basic user flows, validation: Trader feedback on conceptual design and feature prioritization

Cycle 2: Medium-Fidelity Prototyping

Duration: Weeks 7-8, deliverables: Interactive mockups using Stich AI/Adobe XD, focus: User interface design, interaction patterns, and visual hierarchy, validation: Usability testing on navigation efficiency and interface clarity

Cycle 3: High-Fidelity Prototyping

Duration: Weeks 9-10, deliverables: Functional prototype with core voting features, focus: Technical implementation, database integration, and security features, validation: End-to-end workflow testing and performance evaluation

Cycle 4: Pilot Deployment

Duration: Weeks 11-12, deliverables: Refined system ready for pilot deployment, focus: Bug fixes, performance optimization, and user training materials, validation: Real-world usage with 92 sampled traders.

3.4.2 Design Techniques

To ensure systematic and user-centered development of the mobile voting platform, the project will employ multiple design techniques that align with both the Prototype Model and the specific context of Seeta Market traders. These techniques provide visual and structural frameworks for transforming requirements into functional system components (Dennis et al., 2020).

1. Use Case Diagrams

Use Case Diagrams will be developed using Unified Modeling Language (UML) standards to capture functional requirements from the perspective of different user roles (Rumbaugh et al., 2004). This technique will: Define interactions between traders, market leaders, and system administrators, specify core functionalities including voter registration, ballot casting, and results viewing, identify system boundaries and scope through actor-system relationships, serve as communication tools between developers and non-technical stakeholders

2. Entity-Relationship (ER) Diagrams

ER Diagrams will model the database structure using Chen's notation to ensure data integrity and efficient information management (Chen, 1976). Key components include: Entities: Voter, Candidate, Election, Ballot, Results, relationships: Votes_for, Nominates, Manages, Authenticates, attributes with data types and constraints for each entity, normalization to third normal form (3NF) to minimize data redundancy

3. Wireframes and Mockups

Low to high-fidelity wireframes will be created using Figma to visualize the user interface before implementation (Buxton, 2007). These will: Map user journeys from login to vote confirmation,

design intuitive navigation patterns for low-digital-literacy users, incorporate Luganda language options and culturally appropriate icons, ensure mobile-responsive design for various screen sizes

4. User Journey Maps

User Journey Maps will document the end-to-end experience of traders interacting with the system (Kalbach, 2020). This technique will capture: Emotional states at different interaction points, pain points and moments of delight throughout the voting process, touchpoints requiring additional support or clarification, opportunities for improving user satisfaction and trust

5. Data Flow Diagrams (DFDs)

DFDs will model information flow through the system using structured analysis techniques (Yourdon & Constantine, 1979). Levels will include: Context diagram showing system boundaries, level-1 DFD decomposing major processes, detailed process specifications for critical voting operations, data store definitions and access patterns.

3.5 Anticipated Project Constraints

The team identified three key constraints and proposed solutions to mitigate their impact, ensuring the project remains on track within its timeline. Below are the constraints identified and solutions to curb them:

i. Limited Internet Connectivity.

Seeta Market experiences intermittent internet connectivity (approximately 60% network reliability according to UCC 2024 reports), which may affect real-time voting and data synchronization.

Mitigation: Implement offline-capable features using local storage and service workers, develop data synchronization protocols for when connectivity resumes, and conduct testing during peak connectivity hours.

ii. Limited Technical Infrastructure.

The project relies on basic web technologies (PHP, HTML, CSS, JavaScript) which may face performance limitations with concurrent user access during peak voting periods.

Mitigation: Use optimized database queries, implement caching mechanisms, conduct load testing with simulated user traffic, and deploy on affordable but reliable hosting services like Hostinger or Infinity Free.

iii. Time Constraints.

The 14-week project timeline may conflict with academic commitments and market operational hours, potentially delaying development and testing phases.

Mitigation: Apply agile project management, break tasks into two-week sprints with specific deliverables, track progress using milestone charts, and coordinate early morning testing sessions with traders before market peak hours.

3.7 Ethical Considerations.

The project team is committed to upholding the highest ethical standards throughout the development and implementation process. Given the sensitive nature of voting data and personal information, the following ethical considerations will be addressed:

i. Voter Privacy and Ballot Secrecy

The system will ensure complete voter anonymity and ballot secrecy through cryptographic techniques that separate voter identification from vote casting (Nsubuga & Tumwebaze, 2024). Personal voter information will be stored separately from ballot data to prevent any possibility of linking votes to individual traders.

ii. Informed Consent and Transparency

All participants in system testing and the pilot deployment will provide written informed consent after comprehensive explanation of the project's purpose, data usage policies, and their rights to withdraw at any time (Uganda National Council for Science and Technology, 2014). Consent forms will be available in both English and Luganda.

iii. Data Protection and Security

The system will comply with Uganda's Data Protection and Privacy Act (2019) by implementing robust security measures including data encryption, secure authentication protocols, and regular security audits. Personal data will only be used for the specified voting purposes and will not be shared with third parties.

iv. Inclusivity and Non-Discrimination

The platform will be designed to accommodate traders of all ages, gender, and digital literacy levels. Special consideration will be given to ensure the system is accessible to traders with limited technical experience through intuitive interfaces and comprehensive training (Eilu & Baguma, 2023).

v. Transparency in Results

The voting system will incorporate verifiable results mechanisms that allow independent audit while maintaining voter privacy. Election results will be transparently displayed with detailed breakdowns to build trust in the digital voting process (Kato & Luyombo, 2022).

These ethical measures are designed to build trust among Seeta Market traders and ensure the voting platform operates with integrity, transparency, and respect for individual rights.

3.7. References.

- Achieng, R., & Wamuyu, P. (2023). Mobile-based voting interfaces and user experience in low-ICT communities. *East African Journal of Information Systems*, *4*(2), 23–37.
- Alvarez, R. M., Hall, T. E., & Hyde, S. D. (2023). *Election fraud: Detecting and deterring electoral manipulation*. Brookings Institution Press.
- Data Protection and Privacy Act. (2019). *Laws of Uganda*. Uganda Government Press.
- Dennis, A., Wixom, B. H., & Tegarden, D. (2020). *Systems analysis and design: An object-oriented approach with UML*. John Wiley & Sons.
- Denzin, N. K. (2017). *The research act: A theoretical introduction to sociological methods*. Routledge.
- Eilu, E., & Baguma, R. (2023). Barriers to digital civic participation in Uganda's informal markets. *Makerere Journal of Information and Communication Technology*, *11*(2), 70–88.
- Morgan, D. L. (1996). *Focus groups as qualitative research* (2nd ed.). SAGE Publications.
- Mukono District Commercial Office. (2024). *Registered market associations report*. Mukono District Local Government.
- Nsubuga, D., & Tumwebaze, J. (2024). Enhancing transparency in local leadership elections through ICT. *Ugandan Journal of Digital Democracy*, *3*(1), 10–21.
- Opolot, J., & Nakiranda, S. (2024). Trader mobility and governance participation in Ugandan markets. *Journal of Informal Sector Studies*, *8*(3), 45–62.
- Peppers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. *Journal of Management Information Systems*, *24*(3), 45–77.
- Yourdon, E., & Constantine, L. L. (1979). *Structured design: Fundamentals of a discipline of computer program and systems design*. Prentice-Hall.
- Zowghi, D., & Coulin, C. (2005). Requirements elicitation: A survey of techniques, approaches, and tools. In A. Aurum & C. Wohlin (Eds.), *Engineering and managing software requirements* (pp. 19–46). Springer.

3.8. APPENDICES.

I. Proposed Project Budget

Item Description	Quantity	Unit Cost (UGX)	Total Cost (UGX)	Remarks
Human Resources (Developer, Designer, Analyst)	3 people	500,000	1,500,000	Stipend for part-time contribution
Internet Access (Mobile Data Bundles)	3 months	100,000	300,000	For research, development , and testing
Software tools (flutter, firebase, IDEs)	1 set	0	0	Open-source tools used
Hardware (smartphone for testing)	1 unit	600,000	600,000	For prototype testing with traders
Refreshments (focus Group discussions)	3 sessions	100,000	300,000	Light snacks and water for participants
Printing (consent forms, guides, flyers)	50 copies	500	25,000	For trader outreach and documentation on

Estimated Total Budget: UGX 3,225,000