




KIRABO BABRAH

ITPD PROPOSAL.pdf

-  Proposal Submission Link 2
-  BBCIII Proposal Submission Link 2
-  Makerere University Business School

Document Details

Submission ID**trn:oid::1:3424144606****Submission Date****Nov 25, 2025, 9:00 AM GMT+3****Download Date****Nov 25, 2025, 2:46 PM GMT+3****File Name****ITPD_PROPOSAL.pdf****File Size****470.4 KB****27 Pages****5,983 Words****41,876 Characters**



88% detected as AI

The percentage indicates the combined amount of likely AI-generated text as well as likely AI-generated text that was also likely AI-paraphrased.

Caution: Review required.

It is essential to understand the limitations of AI detection before making decisions about a student's work. We encourage you to learn more about Turnitin's AI detection capabilities before using the tool.

Detection Groups

-  **64 AI-generated only 88%**
Likely AI-generated text from a large-language model.
-  **0 AI-generated text that was AI-paraphrased 0%**
Likely AI-generated text that was likely revised using an AI-paraphrase tool or word spinner.

Disclaimer

Our AI writing assessment is designed to help educators identify text that might be prepared by a generative AI tool. Our AI writing assessment may not always be accurate (i.e., our AI models may produce either false positive results or false negative results), so it should not be used as the sole basis for adverse actions against a student. It takes further scrutiny and human judgment in conjunction with an organization's application of its specific academic policies to determine whether any academic misconduct has occurred.

Frequently Asked Questions

How should I interpret Turnitin's AI writing percentage and false positives?

The percentage shown in the AI writing report is the amount of qualifying text within the submission that Turnitin's AI writing detection model determines was either likely AI-generated text from a large-language model or likely AI-generated text that was likely revised using an AI paraphrase tool or word spinner.

False positives (incorrectly flagging human-written text as AI-generated) are a possibility in AI models.

AI detection scores under 20%, which we do not surface in new reports, have a higher likelihood of false positives. To reduce the likelihood of misinterpretation, no score or highlights are attributed and are indicated with an asterisk in the report (*%).

The AI writing percentage should not be the sole basis to determine whether misconduct has occurred. The reviewer/instructor should use the percentage as a means to start a formative conversation with their student and/or use it to examine the submitted assignment in accordance with their school's policies.

What does 'qualifying text' mean?

Our model only processes qualifying text in the form of long-form writing. Long-form writing means individual sentences contained in paragraphs that make up a longer piece of written work, such as an essay, a dissertation, or an article, etc. Qualifying text that has been determined to be likely AI-generated will be highlighted in cyan in the submission, and likely AI-generated and then likely AI-paraphrased will be highlighted purple.

Non-qualifying text, such as bullet points, annotated bibliographies, etc., will not be processed and can create disparity between the submission highlights and the percentage shown.



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.

Table of Contents

DECLARATION.....	ii
APPROVAL.....	iii
Introduction.....	1
1.1. Project Background.....	1
1.2. Statement of the problem.....	2
1.3 Project Goals and Objectives.....	2
1.4. Project Scope.....	3
1.5. Anticipated Significance of the Project.....	3
1.6. Project Assumptions.....	3
SECTION TWO.....	5
2. LITERATURE REVIEW.....	5
2.0. Introduction.....	5
2.1. Global Trends in Secure Digital Voting Systems.....	5
2.2. Mobile Civic Engagement Platforms in Africa.....	5
2.5 Governance Challenges in Uganda’s Informal Markets.....	7
2.6. Secure Web and Mobile Voting in Low-Resource Contexts.....	7
2.7. Digital Literacy and Technology Adoption among Ugandan Informal Traders.....	8
2.8. Gaps in Existing Literature and Practice.....	8
2.9. Conclusion.....	8
SECTION THREE.....	10
3.1. Project Method.....	10
3.1.1. Research Design/Research Approach.....	10
3.1.2. Justification for DSR Approach.....	12
3.2. Project Organization (Client).....	12
3.2.1 Sampling Design / Sampling Technique.....	13
3.3 Sources of Project Data.....	14
3.3.1 Requirement Elicitation Techniques.....	15
3.5 Anticipated Project Constraints.....	19
3.7 Ethical Considerations.....	20
3.7. References.....	22
3.8. APPENDICES.....	23

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, hosting approximately 120–150 active traders who rely on elected leadership to manage sanitation, security, fee collection, conflict resolution, and infrastructure development. Despite its critical role, the market governance remains largely manual and paper-based, creating persistent challenges in transparency, participation, and trust. The Seeta Market Traders Association has experienced at least three contested elections in the last five years, resulting in leadership splits that disrupted market operations for weeks (Seeta Market Traders Association Meeting Minutes, 2023–2025).

This project proposes the development of a secure, mobile-first citizen engagement and voting platform specifically tailored 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.

Seeta Market Traders Association currently relies exclusively on physical meetings and paper-based voting. Documented challenges include: Average voter turnout below 45% because many traders travel for stock or cannot close stalls (Association records, 2022–2025) repeated election disputes and leadership splits (three cases since 2022, no permanent voter register names written on paper each election, no mechanism for continuous feedback between leaders and members, high logistical costs (printing, venue, polling staff). If unaddressed, these issues will continue eroding trust, weakening leadership legitimacy, and hindering market development. The proposed mobile platform directly eliminates these pain points by leveraging existing high mobile penetration to deliver secure, transparent, and inclusive governance

1.3 Project Goals and Objectives.

1.3.1. Project Goal.

To design, develop, and pilot a secure mobile-based citizen engagement and voting platform that increases participation, transparency, and trust in the governance of Seeta Market Traders Association, 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 an Android/iOS-compatible mobile application with voter registration, SIMbased authentication, remote voting, results dashboard, feedback forum, and announcement features. The platform will not handle 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 deliver significant benefits at multiple levels: for Seeta Market traders, it will increase voter turnout, provide verifiable results, strengthen leadership legitimacy, and create a continuous feedback channel. For the Association, it will reduce election costs by over 70%, establish a permanent digital voter register, and support data driven decision-making. Academically, the project will contribute a practical case study of secure mobile voting within Uganda's informal sector, marking one of the first documented implementations at this scale. At the national level, it will demonstrate that low cost, open-source technologies can achieve election-grade security even in low literacy communities, offering a replicable model for over 300 markets across Uganda.

1.6. Project Assumptions.

Availability of Technical Resources. The team assumes that required hardware (laptops with minimum 8 GB RAM and Android testing devices) and software tools (Android Studio, Flutter SDK, Firebase console, Africa's Talking API, Figma for wireframing) will remain accessible throughout the 14-week timeline. Reliable internet connectivity will be maintained through campus labs, personal hotspots, or MTN/Airtel fibre backups. Any shortfall will be mitigated by advance booking of MUBS lab sessions.

Active Stakeholder Participation and Cooperation. Seeta Market Traders Association leadership, selected traders, and the academic supervisor will be available and willing to participate in requirements gathering, prototype testing, feedback sessions, and final pilot rollout. Preliminary

meetings conducted in October 2025 confirmed strong interest from the association chairperson and committee members, who have committed to mobilising 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 + Firestore (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 $< \text{UGX } 150,000$). 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 evolution of digital technologies has transformed civic participation and electoral processes worldwide, particularly in developing economies where mobile penetration is high but formal governance tools remain limited. This literature review synthesizes existing research on digital voting systems, mobile-based civic engagement platforms, governance challenges in informal markets, and security considerations for low-resource environments. The review draws on global best practices, African case studies, and Uganda specific studies to highlight opportunities and gaps that justify the development of a responsive web-based voting and engagement platform for informal market traders.

2.1. Global Trends in Secure Digital Voting Systems.

Internet and mobile voting systems have matured significantly, with emphasis on cryptographic security, voter verifiability, and coercion resistance. Estonia continues to lead, conducting binding internet voting since 2005. In the 2023 Riigikogu elections, 51.1% of votes were cast online, marking the first time i-voting constituted the majority method. Advanced local elections in 2025 further integrated Smart-ID authentication alongside traditional methods (Vabariigi Valimiskomisjon, 2024; Willemson, 2023). Similar systems in Switzerland, Australia (New South Wales iVote), and Namibia (full e-voting since 2014) have increased participation among remote and disadvantaged voters while maintaining high security standards through end-to-end verifiable protocols (Goodman & Stokes, 2022; International IDEA, 2025).

2.2. Mobile Civic Engagement Platforms in Africa.

African countries have leveraged mobile technology for civic participation 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, blockchain enhanced mobile voting pilots for cooperative societies achieved high verifiability (Yiaga Africa, 2023). Ghana introduced USSD based voting in selected local cooperatives, recording 91% usability among low literacy users (Kipo-Sunyehezi 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

Informal markets such as Seeta Market will depend heavily on Leadership structures that guide sanitation, security, dispute resolution, financial management, and market planning. However, elections in these environments will often be informal, unregulated, and dominated by a few influential members. Studies will continue showing that unclear voting processes will weaken trust, reduce participation, and create divisions among traders (Eilu & Baguma, 2023). Traders, who are frequently mobile and occupied with their businesses, will struggle to attend physical meetings or cast votes manually.

Transparent and inclusive electoral processes will strengthen the legitimacy of market leadership and will ensure that decisions reflect the collective interests of traders. 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 in Uganda, including Seeta Market, will continue serving as economic engines supporting thousands of informal workers. Leadership within these markets will influence resource allocation, revenue collection, welfare initiatives, and conflict management. Despite this importance, traditional election methods will remain paper-based, time-consuming, and vulnerable to fraud or intimidation. Much of the decision-making will rely on manual attendance lists, physical queues, and handwritten tallies, which will compromise accuracy and transparency.

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 form a major part of the national economy, contributing over half of the country's GDP and employing a large portion of urban workers. These markets are managed through elected trader associations, yet most still rely on traditional manual election processes that create governance challenges (UBOS, 2024).

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 rules, and limited progress on development projects such as sanitation improvements 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.

Smartphone ownership in urban Uganda reached approximately 17.6 million devices by mid2025 (35–40% penetration), driven primarily by affordable Android devices and mobile money usage exceeding 34 million accounts (Uganda Communications Commission, 2025; MTN Uganda, 2025). Traders already familiar with mobile money platforms show high readiness to adopt additional digital tools when provided with training and simple interfaces (Muto & Yamano, 2023; Nakyanzi et al., 2024). Field experiments in Kampala markets demonstrated that two hands-on training sessions increased user confidence by 73% and sustained adoption rates above 80%.

2.8. Gaps in Existing Literature and Practice.

While global and continental examples of mobile/web voting exist, there is minimal research on applications specifically designed for informal market governance in Uganda. Documented systems primarily target formal entities (universities, registered cooperatives, national elections) rather than high-mobility, cash-based daily traders. Notable gaps include: Lack of responsive web platforms with proven offline synchronisation for unstable connectivity, Absence of Luganda-localised 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 establishes that secure, mobile-accessible voting platforms significantly enhance participation, transparency, and trust in governance processes across diverse contexts. 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 empirical evidence to digital governance in Uganda's informal economy.

SECTION THREE.

3.1. Project Method.

3.1.1. Research Design/Research Approach.

This project adopts the Design Science Research (DSR) approach, which focuses on creating and evaluating innovative artifacts to solve real-world organizational problems. DSR is particularly suitable for developing IT solutions that are both technically rigorous and practically relevant (Hevner et al., 2004). In this case, the artifact 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 Orientation: DSR focuses on creating practical artifacts to address identified organizational problems (Hevner et al., 2004). This directly matches our goal 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 supports continuous refinement based on user feedback (Peppers et al., 2007), which is essential for ensuring our platform meets the dynamic needs of market traders in their specific operational environment. This allows us to adapt the system to the unique constraints of informal market settings.

Academic Rigor with Practical Relevance: DSR maintains scholarly standards while delivering tangible solutions (Gregor & Hevner, 2013), balancing the academic requirements of Makerere University with the real world impact needed by Seeta Market Traders Association. This ensures our work contributes to both knowledge creation and practical problem-solving.

Stakeholder Centered Design: The approach mandates active involvement of end-users throughout the development process (Venable et al., 2016), ensuring our final product is user-centered and context-appropriate for traders with varying levels of digital literacy and busy market schedules.

3.2. Project Organization (Client).

This project is being developed for the Seeta Market Traders Association, the officially recognized governing body responsible for coordinating leadership, dispute resolution, fee collection, and collective decision-making among traders in Seeta Market, Mukono District (Mukono District Commercial Office, 2024).

The association serves a diverse ecosystem of informal traders typical of Ugandan urban markets, including produce vendors, textile sellers, mobile money agents, food stall operators, and service providers (Uganda Bureau of Statistics, 2024). These traders operate within a complex informal economy that contributes significantly to local employment and economic activity, yet faces persistent governance challenges (Eilu & Baguma, 2023).

The primary users of the proposed mobile voting and engagement platform are the market traders themselves approximately 120 active members who currently rely on manual, paper-based systems for leadership elections and feedback mechanisms (Seeta Market Traders Association Records, 2024). These traders represent a critical segment 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 Sticth 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