

Secure Remote Voting System

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INTRODUCTION

The Problem

Millions of Non-Resident Indians (NRIs) are effectively disenfranchised — the Election Commission of India requires physical presence at polling stations to vote, making participation impossible for most overseas citizens.

25M+

NRIs Globally

0

Digital Vote Options

6

Research Gaps Addressed

RESEARCH QUESTIONS

- How can voter anonymity be preserved while ensuring reliable eligibility verification?
- What mechanisms prevent double voting & vote tampering in a distributed system?
- Can distributed ledger tech (Ethereum vs. lightweight ledger) improve transparency?
- How can coercion resistance be improved through re-voting & time-delayed finalisation?

● Primary ● Secondary

STATE OF THE ART & IDENTIFIED GAPS

Identity-Vote Linkage

Token-based separation: identity verified once, anonymous token issued

End-to-End Verifiability

Vote tracking via cryptographic hash + public audit ledger

Coercion Resistance

Re-voting (last vote counts) + time-delayed finalisation

Blockchain Overuse

Comparative eval: Ethereum smart contract vs. lightweight ledger

No Diaspora Model

Specifically designed for cross-border, low-trust environments

Poor Usability

Clean web-based UI — no specialist hardware required

PROPOSED SYSTEM ARCHITECTURE

1 Identity Verification

MFA + NRI voter roll check

2 Token Issuance

Cryptographically signed one-time token

3 Encrypted Ballot

Asymmetric encryption — anonymous submission

4 Coercion Mitigation

Re-voting allowed · time-delayed finalisation

5 Audit Ledger

Immutable append-only log · Ethereum comparison

6 Voter Verification

Hash receipt lookup — verifiable, private

METHODOLOGY

Design Science Research (DSR)

Phase 1

Literature Review

Wks 1–3

Phase 2

System Design

Wks 4–6

Phase 3

Prototype Build

Wks 7–10

Phase 4

Testing & Evaluation

Wks 11–12

Phase 5

Writing & Submission

Wks 13–15

Technology Stack

React.js

Node.js

Ethereum

SYSTEM COMPARISON

Feature	Estonia i-Voting	Blockchain Systems	Proposed System
Voter Anonymity	Partial	Partial	Full (token-based)
E2E Verifiability	Limited	Yes	Yes (hash receipt)
Coercion Resistance	Weak	Weak	Improved
Diaspora Focus	No	No	Yes
Usability	Medium	Low	High (web-based)

EXPECTED OUTCOMES

- Functional web-based voting prototype
- Security analysis against defined threat model
- Blockchain vs. ledger comparative evaluation
- Usability evaluation with heuristic testing
- Evidence-based recommendations for NRI deployment