EVMs and Electoral Democracy: Lessons from India's Experience

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Abstract:

The introduction of Electronic Voting Machines (EVMs) has significantly reshaped India's electoral process, enhancing efficiency and accessibility. However, concerns regarding the security, transparency, and potential manipulation of EVMs have emerged, raising questions about their impact on the integrity of elections and public trust in the democratic system. This study aims to investigate these concerns, analyse their Implications for electoral integrity, and identify effective mitigation strategies to restore confidence in the use of EVMs. Through a combination of literature review, expert interviews, case studies, and nationwide surveys, this research will examine the key challenges surrounding EVM adoption and usage, including security vulnerabilities, allegations of tampering, and public perceptions. The expected outcomes include a comprehensive understanding of the issues at hand, evidence-based recommendations to strengthen EVM security and transparency, and strategies for fostering greater public awareness and trust in the electoral process. This study will contribute to informed policy discussions on enhancing the reliability and accountability of electronic voting systems in India's democracy.

Keywords: Electoral Reform, Electoral Integrity, EVMs, Democracy, and Indian Election.

Introduction:

The inception of Electronic Voting Machines (EVMs) in India during the early 1980s represented an ambitious attempt to overhaul a voting system plagued by logistical complexities, rampant malpractice, and ballooning costs. Beginning with experimental forays in Kerala, the Election Commission of India (ECI) led a progressive national deployment, culminating in battleground elections governed entirely by EVMs from 2004 onwards. These machines promised unprecedented efficiency: streamlined vote counting, logistical simplification, and eradication of traditional fraud like booth capturing. However, India's democratic infrastructure faced unforeseen challenges as allegations of manipulation, questions about verifiability, and shrinking trust in poll institutions began to surface.

By 2024, pre-electoral trust had decisively shifted. According to CSDS-Lokniti surveys, only 28 percent of voters expressed strong confidence in the ECI, down from 51 percent in 2019—while 45 percent voiced belief that EVMs could be manipulated by the ruling party (The Print, 2025; The Hindu, 2024). This growing skepticism coincided with high-profile testimonies, political op-eds, and forensic audits that collectively questioned whether India's digital polling mechanism, distinguished

by scale and efficiency, was also sufficiently transparent and accountable. This paper investigates these complex dynamics by analyzing technical vulnerabilities and survey data, mapping legal reforms and trust interventions, examining political narratives, and embedding India's experience within a global context. The objective is to propose a reform strategy that supports both technical viability and democratic acceptance.

Historical Evolution and Institutional Context:

EVMs were first introduced experimentally in Kerala in 1982, responding to widespread ballot fraud and logistical inefficiencies. Over the next two decades, a phased national rollout ensued, culminating in a 2004 general election held entirely with EVMs (Election Commission of India, 2019; Wikipedia, 2025). Developed by public firms BEL and ECIL under ECI specifications, these machines were designed as heavy-duty, battery-powered, self-contained units with no network connectivity—effectively shielding voting from remote intrusion (Wikipedia, 2025). To ensure procedural legitimacy, ECI implemented mid-election audits, mock polls involving political agents, sealing mechanisms, and chain-of-custody protocols (The Probe, 2024).

A watershed moment came in 2013 when the Supreme Court, in response to transparency demands, mandated introduction of Voter Verifiable Paper Audit Trails (VVPATs), piloted in 2014 and mandated fully by 2019 under Court direction (Wikipedia, 2025). The ECI adopted an initial policy of verifying five randomly selected VVPAT machines per assembly segment during counting. However, subsequent public pressure and judicial activism led to a 2025 Supreme Court judgment requiring cross-verification of at least one VVPAT slip per polling station to strengthen reconcilement between electronic counts and voter records (Prime Legal, 2025).

Despite these reforms, no statutory basis for audit, code transparency, or external oversight was legislated. The system remained reliant on executive discretion under ECI authority, increasingly criticized for its opacity. Trust in elections began to falter as technology outpaced legal accountability, prompting urgent calls for recalibrated institutional frameworks.

Efficiency, Inclusion, and Electoral Integrity:

The Brookings India study by Debnath, Kapoor, and Ravi (2017) offers quantifiable evidence of the positive effects of EVM adoption. Following phased rollouts, incidences of booth capturing and electoral violence decreased significantly, while participation rates rose across women, Scheduled Castes, and Scheduled Tribes—indicating enhanced inclusivity. Closer electoral margins suggested more competitive politics, and infrastructural improvements in electrification and road quality hinted at indirect developmental benefits. These findings confirm that, in many respects, EVMs delivered on their promise of greater accessibility, fairness, and efficiency.

Further supporting evidence is found in mock-poll data. In the 2019 Lok Sabha elections, cross-checked VVPAT slips across sample booths showed zero mismatches between paper trails and recorded votes (India Today, 2025). This corroborates the reliability of EVM vote recordings and addresses key criticism about "black-box" opacity. Thus, from a delivery standpoint, EVMs have demonstrably improved electoral logistics and outcomes.

Security Vulnerabilities and Technical Weaknesses

Despite positive trends, adversarial research has raised fundamental questions about EVM integrity. In 2010, Halderman, Prasad, and Gonggrijp demonstrated that Indian EVM memory and circuits

might be susceptible to tampering through component substitution or memory manipulation—albeit with physical access to the machine (Halderman et al., 2010). Such attacks, while technically feasible, rely heavily on insider cooperation rather than external hacking. In 2024, Devpura and Johari presented a forensic case study in which an actual EVM was accessed and manipulated using custom hardware, modifying internal vote records and underscoring that official seals and storage procedures alone are not foolproof (Devpura & Johari, 2024). The paper criticized reliance on procedural rather than digital tamper resistance, advocating for independent audits, code transparency, and legal deterrents for staff violations.

India Today's technical coverage reinforces this conclusion: the design is offline and sealed, but remains susceptible to insider malpractices, especially where custody is inadequately monitored (India Today, 2025). Together, these findings challenge deterministic assumptions of EVM invulnerability and demand the incorporation of robust audit frameworks.

Transparency, Audits, and Institutional Trust:

Perceived procedural sanctity is insufficient without verifiable transparency. While VVPAT introduced a physical record of each vote, auditing was restricted to a meagre 0.4 percent of polling stations—a level that remains statistically inadequate (Mohanty et al., 2019). Transparency advocates argue for adoption of Risk-Limiting Audits (RLAs), which require examining a small, unpredictable sample of paper trails to confirm overall election integrity with quantifiable confidence—without imposing full recount burdens. The existing Supreme Court ruling that mandates at least one VVPAT slip per polling station during result reconciliation signifies progress toward legal accountability (Prime Legal, 2025). Yet, it remains an executive discretion rather than codified legal requirement. Civil society and media investigations—such as the Quint's report on discrepancies between votes polled and counted, with over 554,598 votes discarded across 362 constituencies in 2024 (The Quint, 2024)—have fuelled demand for greater Form 17C transparency and legal computability. Frontline editorial analysis (2024) asserts that ECI's opacity undermines independence, linking credibility to access: open-source firmware disclosure, independent hardware and software audits, and publishable audit data must accompany procedural safeguards. In this sense, transparency is not merely an adjunct to security; it is its democratic cornerstone.

Public Perception and Political Discourse:

Electoral technologies live or die on public confidence. A 2024 CSDS-Lokniti survey revealed a collapse in institutional trust: 45 percent believed EVM manipulation was possible, 28 percent expressed little confidence in the ECI, and 16 percent lacked any trust whatsoever—doubling their 2019 levels (The Muslim, 2024; Outlook India, 2024). Urban, minority, and opposition-aligned voters registered more acute skepticism. Political narratives compounded these fears. In June 2025, Rahul Gandhi published an op-ed alleging a five-step "match-fixing" of Maharashtra elections, accusing centrally-appointed ECI staff, phantom voters, inflated turnout figures, concealed postal ballots, and missing EVM seals (Indian Express, 2025). ECI and BJP leaders dismissed these claims as conspiratorial, but the controversy highlighted that distrust—regardless of evidence—can politically destabilize electoral consensus. Al Jazeera documented the persistence of "the king's soul in the EVM" meme, noting that votes are no longer seen as private, but as potential proxies of central power (Al Jazeera, 2024). Political scandal, forensic evidence, and rolling distrust coalesce to erode democratic legitimacy, showing that technological reliability cannot substitute for transparent, accountable electoral governance.

Comparative Lessons from Other Democracies:

India's experience leads global electoral debate. Nations such as Germany, Ireland, and the Netherlands reversed previously adopted electronic voting due to unresolvable transparency concerns, shifting toward verifiable paper ballots (Frontline, 2024; Wikipedia, 2025). Brazil and the Philippines maintain EVM systems but integrate biometric checks, centralized hardware audits, and open-source protocols to safeguard integrity—creating a hybrid model of electronic efficiency and manual verification by design. The United States is now testing RLAs in select jurisdictions, partly inspired by academic work like Mohanty et al. (2019), which demonstrates EVMs can be both efficient and trustworthy when supported by rigorous audit sampling. India's need, then, is not to discard EVMs, but to overlay current systems with proven safeguards, namely, verifiable procedures and public accountability to match digital modernization.

Policy and Institutional Recommendations:

A sustainable reform agenda must be multidimensional:

- First, implement a mandatory national risk-limiting audit protocol to validate a statistically significant sample of VVPAT-EVM cross-verification. By focusing only on samples of sufficient size, this system can reinforce trust without unduly delaying results.
- Second, institutionalize polling-station-level cross-verification in legal frameworks, including public reporting of audit outcomes and Form 17C data, thereby making transparency mandatory.
- Third, convert EVM and VVPAT firmware to open-source platforms, and establish impartial, regular audits by external technical bodies, consolidated under parliamentary election committees.
- Fourth, strengthen voter roll integrity via machine-readable public databases, CCTV-monitored storage, and removal/redress protocols, particularly to guard against disenfranchisement of marginalized populations.
- Fifth, launch comprehensive civic-engagement campaigns, disseminated in vernacular languages, illustrating EVM architecture, audit procedures, legal protections, and the democratic value of verifiable results.
- Finally, embed voter oversight into law by granting candidates and civil society watchdogs' access to software, audit logs, and ECI accountability reports, similar to regulatory public utility models—ensuring electoral trust is institutionally nurtured.

Conclusion:

India's EVM transformation has provided valuable logistical benefits and reduced overt fraud. However, as this paper demonstrates, democratic legitimacy demands more than administrative efficiency. Trust lies in transparency—in auditability, system visibility, legal oversight, and responsive governance. India's judicial directives, forensic audits, and political discourse all signal that though the technology is robust, the system is not yet democratically complete. Reinforcing EVM systems with risk-limiting audits, open-source transparency, and civic scrutiny elevates India's democratic infrastructure to match its managerial ambition. As other nations ponder digital electoral innovations, India's experience offers a template: modernize, but with accountability in hand.

References:

1. Al Jazeera. (2024, March 29). *Can India's coming elections be rigged? "Soul of the king" narrative resurfaces*. Retrieved from [Al Jazeera website] m.thewire.in+1theprint.in+1theprint.inthequint.com+1reddit.com+1
2. Brookings India. Retrieved from https://www.brookings.edu
3. Debnath, S., Kapoor, M., & Ravi, S. (2017). *The impact of electronic voting machines on electoral frauds, democracy, and development*.
4. Devpura, H., & Johari, Y. (2024). Critical analysis of electronic voting system security concerns and policy implications in India. *International Journal of Advanced Legal Research, 4*(3).
5. Election Commission of India. (2019). *Manual on EVM and VVPAT*. Retrieved from https://eci.gov.in
6. Halderman, H. K., Prasad, R., & Gonggrijp, R. (2010). Security analysis of India's electronic voting machines. *CCS '10 Proceedings*. Retrieved from https://jhalderm.com/pub/papers/evm-ccs10.pdf thequint.com+12drishtiias.com+12en.wikipedia.org+12
7. India Today. (2025, January 10). *How EVMs work? Is India's voting system secure enough? India Today Explains*. [Video]. YouTube.
8. Indian Express. (2025, June 5). Rahul Gandhi writes: Maharashtra match-fixing. *The Indian Express*.
9. Mohanty, V., Akinyokun, N., Conway, A., Culnane, C., Stark, P. B., & Teague, V. (2019). *Auditing Indian elections*. Retrieved from arXiv. arxiv.org
10. Pal, A. (2024, April 30). Ebbed public trust in election process can and must be reversed. *The Wire*. m.thewire.in
11. Prime Legal. (2025). Supreme Court decision: EVM-VVPAT cross-verification for enhanced other electoral transparency. reddit.com+13drishtiias.com+13reddit.com+13
12. The Print. (2025, April 15). Percentage of voters who don't trust ECI nearly doubled in last five years—CSDS-Lokniti survey. livemint.com+5theprint.in+5m.thewire.in+5
13. The Quint. (2024, June 5). EVM data mismatch: 554,598 votes 'discarded' across 362 Lok Sabha seats. *The Quint*. reddit.com+7thequint.com+7reddit.com+7
14. Wikipedia. (2025). *Electronic voting in India*. Retrieved from https://en.wikipedia.org/wiki/Electronic_voting_in_India en.wikipedia.org