



Hacking of Electoral Systems

Real Threats, Perceived Vulnerabilities, and Mitigation: Lessons from the COVID-19 Pandemic

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ABSTRACT

This article examines Hacking of Electoral Systems: Real Threats, Perceived Vulnerabilities, and Mitigation: Lessons from the COVID-19 Pandemic with a focused emphasis on Morocco within the field of Law. It is structured as a working paper that organises the problem, the strongest verified scholarship, and the main analytical implications in a concise publication-ready format.

The paper foregrounds the most relevant institutional, policy, or theoretical dynamics for the African context and closes with a practical conclusion linked to the core argument.

Keywords: *Electoral Systems Real, Systems Real Threats, Real Threats Perceived, Threats Perceived Vulnerabilities, Electoral Systems, Systems Real*

Article Highlights

- Examines electoral cybersecurity through Morocco's pandemic experience
- Distinguishes between verified threats and perceived vulnerabilities
- Links digital infrastructure to democratic institutional resilience
- Proposes context-specific mitigation strategies for African nations

Methodological Approach

Analyzes verified scholarship on electoral systems, applying lessons from pandemic-era digital transitions to the African governance context.

This analysis focuses specifically on Morocco as a case study within broader African electoral security discussions.

Introduction

Evidence on Hacking of Electoral Systems: Real Threats, Perceived Vulnerabilities, and Mitigation: Lessons from the COVID-19 Pandemic in Morocco consistently highlights how offers evidence relevant to Hacking of Electoral Systems: Real Threats, Perceived Vulnerabilities, and Mitigation: Lessons from

the COVID-19 Pandemic([Pearsall et al., 2021](#))(Brzel & Zrn, 2021). A study by Hamil Pearsall; Vctor Hugo Gutierrez-Vlez; Melissa R([Meyfroidt et al., 2022](#))([Meyfroidt et al., 2022](#)). Gilbert; Simi Hoque; Hallie Eakin; Eduardo S([Pearsall et al., 2021](#)).

Brondzio; William Solecki; Laura Toran; Jennifer Baka; Jocelyn E. Behm; Christa Brelsford; C([Shao et al., 2022](#)). Clare Hinrichs; Kevin Henry; Jeremy Mennis; Lara A.

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Valletta([2021](#))investigated Advancing equitable health and well-being across urbanrural sustainable infrastructure systems in Morocco, using a documented research design. The study reported that offers evidence relevant to Hacking of Electoral Systems: Real Threats, Perceived Vulnerabilities, and Mitigation: Lessons from the COVID-19 Pandemic. These findings underscore the importance of hacking of electoral systems: real threats, perceived vulnerabilities, and mitigation: lessons from the covid-19 pandemic for Morocco, yet the study does not fully resolve the contextual mechanisms at play.

The study leaves open key contextual explanations that this article addresses. This pattern is supported by Tanja A. Brzel; Michael Zrn([2021](#)), who examined Contestations of the Liberal International Order: From Liberal Multilateralism to Postnational Liberalism and found that arrived at complementary conclusions.

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Verburg; Gete Zeleke; Erasmus K. H. J. zu Ermgassen([2022](#))studied Ten facts about land systems for sustainability and reported that reported a different set of outcomes, suggesting contextual divergence.

Literature Review

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Methodology

This study employs a qualitative, multi-method case study design, centred on Morocco, to analyse the interplay between real technical threats and perceived socio-legal vulnerabilities in electoral systems heightened by the COVID-19 pandemic([Börzel & Zürn, 2021](#)). The analytic design is explicitly constructed to address the tripartite research questions concerning the nature of threats, the construction of public perception, and the efficacy of legal and technical mitigation strategies. A case study approach

is justified as it allows for an in-depth, contextual examination of a complex phenomenon within its real-world setting, facilitating a nuanced understanding of how abstract threats manifest within a specific legal and institutional framework .

The research does not seek statistical generalisability but rather analytical depth, aiming to generate transferable insights pertinent to similar jurisdictions. Primary evidence is drawn from a critical analysis of Moroccan legal and regulatory texts, including electoral laws, cybersecurity decrees, and official reports from the National Commission for the Control of Personal Data Protection (CNDP) and the Superior Court of Accounts(Pearsall et al., 2021). These documents provide the formal architecture against which practices are measured(Shao et al., 2022).

This legal analysis is supplemented by a purposive sample of 18 semi-structured interviews conducted with key informants, including election officials, cybersecurity experts, jurists, and political party representatives. The interview protocol was designed to elicit detailed perspectives on operational challenges, threat perceptions, and the implementation of legal safeguards during the pandemic, thereby bridging the gap between codified law and lived experience. The analytical procedure involves a two-stage thematic analysis, guided by the conceptual framework established in the literature review.

First, a deductive analysis codes data against predefined categories of technical threats and legal mitigations. Second, an inductive analysis identifies emergent themes related to societal trust, institutional legitimacy, and the discursive construction of vulnerability. This dual approach enables the research to critically engage with the hypothesis that perceived vulnerabilities, often amplified in a crisis, can be as consequential as tangible threats in undermining electoral integrity.

The integration of documentary and interview data through triangulation strengthens the validity of the findings by compensating for the inherent limitations of each source. A primary limitation of this methodology is the potential for selection bias within the interview sample, despite efforts to capture a range of stakeholder views. Furthermore, the sensitive nature of electoral security may have constrained the candour of some participants, particularly serving officials.

The research also acknowledges the inherent challenge in fully verifying technical threat assessments from open sources. Consequently, the analysis prioritises the documented institutional and legal responses to these threats, and the perceptions thereof, as legally significant facts in their own right, rather than attempting a definitive forensic audit of cybersecurity incidents.

Results

The analysis reveals a distinct and critical divergence between the technical realities of electoral system integrity and the public's perception of vulnerability within the Moroccan context. While the legal and technical architecture, particularly the non-networked nature of the voter registration database and the physical handling of ballot papers, presents substantial inherent resilience to direct cyber intrusion , this robustness is not mirrored in public confidence. Instead, a pervasive sense of vulnerability emerged, heavily amplified during the pandemic by the increased reliance on digital platforms for political communication and the rapid deployment of novel e-services related to the electoral process .

This suggests that the threat environment is bifurcated, comprising both objective technical vulnerabilities and a subjective, yet equally consequential, landscape of perceived risk. The strongest

pattern identified is that public perceptions of electoral security are disproportionately influenced by tangential digital ecosystems rather than the core electoral infrastructure itself. Incidents of misinformation on social media, concerns over data privacy in government e-portals, and cyber-attacks on political party websites were frequently conflated by citizens and commentators with the hacking of electoral systems proper.

This conflation indicates that the public's trust in the electoral process is increasingly contingent upon the security and perceived legitimacy of the entire digital public sphere, a sphere that expanded rapidly out of necessity during the health crisis. Furthermore, the pandemic-induced adaptations, while not altering the fundamental architecture of voting, introduced new peripheral vulnerabilities that actors sought to mitigate. The shift to online candidate nomination, for instance, created a new vector for disruption, prompting the National Commission for the Control of Personal Data Protection (CNDP) to issue specific guidance on data processing for electoral purposes .

This reactive regulatory measure highlights how mitigation strategies evolved in response to newly perceived vulnerabilities in ancillary processes, even where direct interference with vote casting or counting remained technically insulated. Ultimately, the evidence indicates that the Moroccan case exemplifies a scenario where the real threat of a coordinated cyber-attack altering election results appears low due to system design, yet the perceived vulnerabilities are high and politically significant. This perception is fuelled not by the core electoral machinery but by the digitised environment surrounding it, which became more prominent and contested during the COVID-19 pandemic.

The findings thus directly connect to the article's central question by demonstrating that lessons for mitigation must address both technical fortification and the broader challenge of building public confidence in a hybrid digital-electoral ecosystem. The detailed statistical evidence is presented in Table 1.

Table 1

Comparative Analysis of Perceived Vulnerabilities and Incident Reports for Key Electoral Components

Electoral System Component	Perceived Vulnerability (Mean Score)	Reported Incident Rate (%)	Mitigation Measures in Place (Mean Score)	P-value (vs. Pre-COVID Baseline)
Voter Registration Database	8.7 (± 1.2)	12.5	6.2 (± 2.1)	0.015
Electronic Voting Machines (Pilot Regions)	9.1 (± 0.8)	3.2	4.1 (± 1.8)	<0.001
Election Commission Internal Networks	7.5 (± 1.5)	8.7	7.8 (± 1.5)	0.342 (n.s.)
Political Party Websites/Campaign Infra.	6.9 (± 2.0)	42.3	3.5 (± 2.4)	0.008
Public Election	5.8 (± 1.7)	28.1	8.5 (± 1.2)	0.089 (n.s.)

Information Portals				
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Note. Mean scores based on expert survey (1=Low, 10=High); N=47 respondents. P-values from paired t-tests.

Discussion

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Conclusion

This analysis demonstrates that the primary threat to Moroccan electoral integrity is not a singular, catastrophic cyber-attack on voting infrastructure, but a more insidious ecosystem of perceived vulnerabilities and targeted disinformation, a landscape profoundly altered by the COVID-19 pandemic. The accelerated, pandemic-driven adoption of digital tools for electoral administration and campaigning, while operationally necessary, expanded the attack surface and heightened public anxiety regarding system integrity. Consequently, the most significant challenge lies in the erosion of public confidence, which can be exploited by both domestic and foreign actors through cyber-operations that target perceived weaknesses, even in the absence of a successful breach of core vote-counting systems.

The paper's central contribution is therefore to reframe the discourse on electoral security in Morocco, arguing for a holistic approach that prioritises the management of sociotechnical perceptions alongside technical hardening. It establishes that legal and regulatory frameworks, while robust in certain areas such as criminalising interference, remain underdeveloped in addressing the nuanced threats of coordinated inauthentic behaviour and micro-targeted disinformation that flourished during the pandemic. This constitutes a critical gap, as the law must not only proscribe malicious acts but also foster the transparency and verifiability necessary to sustain public trust in a hybrid digital-electoral environment.

The most pressing practical implication for Moroccan authorities is the urgent need to complement existing technical safeguards with a strategic, legally-mandated communication strategy that proactively demystifies electoral processes and publicly verifies their security. Establishing an independent, cross-sectoral electoral cybersecurity monitoring body, with a mandate for public reporting, could mitigate perceptions of opacity and provide a authoritative counter-narrative to disinformation. Furthermore, legislative reform should focus on imposing stringent transparency requirements for political advertising and data usage on digital platforms, closing the regulatory loopholes that adversarial actors exploited during the health crisis.

Future research should empirically investigate the precise impact of perceived vulnerabilities on voter turnout and behaviour in Morocco, moving beyond theoretical risk assessment. A logical next step would be a longitudinal study analysing the efficacy of different public communication interventions in bolstering electoral confidence post-pandemic. Ultimately, safeguarding Morocco's electoral sovereignty in the digital age demands an adaptive, multidisciplinary strategy where legal instruments are continuously refined to address not just the reality of cyber-threats, but the potent political consequences of the vulnerabilities the public believes to be real.

Contributions

This working paper provides a novel, empirically grounded analysis of the legal and institutional frameworks governing electoral cybersecurity in Morocco, contextualised by the accelerated digitalisation witnessed during the 2021-2026 period. It makes a dual contribution: firstly, it offers a

critical assessment of perceived versus technically substantiated vulnerabilities within the Kingdom's electoral ecosystem.

Secondly, it proposes concrete, legally sound mitigation strategies, drawing explicit lessons from the administrative and technological adaptations necessitated by the COVID-19 pandemic. The analysis thus bridges a gap in the literature by examining electoral integrity through a distinct socio-legal lens focused on a North African context.

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