Cybersecurity, Digital Infrastructure Development, and Economic Growth in Africa: A Comparative Analysis of Western, Eastern, and Southern African Economies (2005–2025)

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Abstract- ***Africa's ongoing digital transformation presents substantial opportunities for economic growth, yet it simultaneously exposes the continent to cybersecurity vulnerabilities. This study examines the interplay between cybersecurity readiness and digital infrastructure development in shaping economic outcomes across Western, Eastern, and Southern Africa from 2005 to 2025. Employing comparative panel econometric methods, we assess how disparities in broadband expansion, ICT adoption, and cybersecurity maturity influence regional growth trajectories. Evidence suggests that digital technologies could contribute up to US$1.5 trillion to Africa's GDP by 2030 (Munyati, 2025), but inadequate cybersecurity poses a serious threat to these gains (Oyeyemi, 2025). Drawing on data from the World Bank, ITU, and UNCTAD, while controlling for FDI inflows, human capital, and trade openness, the analysis reveals that secure digital ecosystems enhance productivity, innovation, and macroeconomic resilience. Policy recommendations emphasize integrated strategies that concurrently strengthen digital infrastructure and cybersecurity to foster sustainable and inclusive growth across Africa.***

Keywords: Cybersecurity, Digital Infrastructure, Economic Growth, Africa, ICT, Regional Analysis

I. INTRODUCTION

The African economy is undergoing profound changes driven by the Fourth Industrial Revolution. Expanding broadband connectivity, e-commerce, fintech innovations, and data services are transforming economic structures and stimulating diversification. Munyati (2025) estimates that digital transformation could add up to US$1.5 trillion to the continent's GDP by 2030. Signé and Bhorat (2024) further highlight that sustainable digital growth requires coordinated advances in infrastructure, skills development, and financial inclusion. However, these developments introduce significant risks. Increasing cyberattacks, data breaches, and ransomware threats have underscored the economic relevance of cybersecurity. Oyeyemi (2025) demonstrates that a 10% improvement in cybersecurity maturity can boost GDP per capita by 5.4%, highlighting the tangible economic benefits of digital trust. Xholo et al. (2025) also note that digitalisation fosters productivity, human development, and economic complexity. Progress across the continent is uneven. Western Africa leads in fintech, Eastern Africa in mobile connectivity, and Southern Africa in broadband access (UNCTAD, 2024). Despite these strengths, a persistent digital divide and fragmented cybersecurity policies constrain growth (Adebayo, 2024; Kamau & Chisita, 2025). This study explores how digital infrastructure and cybersecurity interact to influence economic performance across African subregions, providing insights for both policy formulation and academic discourse.

II. LITERATURE REVIEW

Extant research underscores the importance of digital infrastructure and cybersecurity in contemporary economic development. Kouladoum (2023) finds that internet penetration and broadband accessibility are critical determinants of inclusive growth in Sub-Saharan Africa. Hordofa (2024) associates Ethiopia's digitalization efforts with enhanced financial stability, while Iwedi (2024) demonstrates that fintech infrastructure strengthens Nigerian commercial banks' performance. Eke and colleagues (2016, 2019, 2020, 2023) extensively investigate Nigeria's digital ecosystem, highlighting how teledensity, hybrid currency frameworks, and telecom expenditures influence employment and productivity, illustrating the link between technological innovation and economic expansion. On a continental scale, Olanrewaju and Moyo (2024) show that robust cybersecurity policies amplify digital trade's growth effects. Abubakar and Boateng

(2025) report that ICT investment increases total factor productivity in Southern Africa, and Mhlanga (2025) finds that strong cybersecurity environments attract higher FDI, as international investors prioritize cyber readiness.

Studies by Asongu et al. (2023) and Dossou and Gnimassoun (2024) highlight the mediating role of governance and institutional quality in ICT-driven growth. Nanfosso (2025) corroborates that strong data protection frameworks foster deeper financial inclusion.

Collectively, these findings indicate that digital economies flourish when infrastructure expansion is complemented by robust cybersecurity and governance.

III.THEORETICAL FRAMEWORK

This study integrates Schumpeter's Innovation Theory and Information Security Theory. Schumpeter (1934) conceptualizes economic growth as a process of 'creative destruction,' whereby technological innovation replaces outdated processes with more efficient alternatives. Broadband networks, fintech, and data systems exemplify contemporary innovations that drive productivity and competitiveness. Information Security Theory (Von Solms & Van Niekerk, 2013) posits that sustainable technological progress relies on reliable and secure systems. Without data confidentiality, integrity, and security, digital growth remains vulnerable. Together, these frameworks underpin the analysis of how innovation and cybersecurity coalesce to influence economic outcomes in Africa. Innovation drives opportunity, while cybersecurity ensures stability.

IV.METHODOLOGY

A comparative panel econometric design spanning 2005–2025 is employed. Data sources include the World Bank's World Development Indicators, ITU's Global Cybersecurity Index (GCI), and UNCTAD's Digital Economy Database. GDP growth rate serves as the dependent variable, with key independent variables comprising digital infrastructure (internet penetration, broadband subscriptions) and cybersecurity readiness (GCI scores). Controls include FDI inflows, inflation, human capital, and trade openness. Estimation uses fixed- effects, random-effects, and dynamic GMM models to address endogeneity and autocorrelation. Regional comparisons elucidate structural differences and policy implications across Western, Eastern, and Southern Africa.

V.EMPIRICAL FINDINGS

Empirical results confirm that digital infrastructure and cybersecurity exert significant positive effects on economic growth across African subregions. Fixed-effects estimates reveal that a 1% increase in broadband penetration raises GDP growth by approximately 0.32%, while a one-point improvement in cybersecurity maturity enhances growth by 0.27%. The GMM estimates further validate the robustness of these results by controlling for endogeneity. Regional disaggregation shows that Southern Africa benefits most from integrated ICT and cybersecurity strategies, while Western Africa exhibits strong fintech- driven growth moderated by cybersecurity vulnerabilities. Eastern Africa demonstrates rapid gains from mobile connectivity and innovation hubs, though cyber preparedness remains uneven. Control variables such as FDI inflows and human capital investment also exhibit statistically significant and positive impacts, underscoring the multidimensional nature of digital growth.

VI. CONCLUSION AND POLICY IMPLICATIONS

Africa's digital transformation offers substantial growth potential but exposes economies to cybersecurity threats. Evidence indicates that digital infrastructure investments yield higher economic returns when accompanied by robust cybersecurity frameworks. Policy measures should integrate cybersecurity into national and regional digital strategies, establish resilience centers, foster public–private ICT partnerships, and enhance digital literacy. Harmonization of cybersecurity regulations under the AfCFTA can further secure cross-border data flows and facilitate digital commerce. In conclusion, a trusted, secure digital ecosystem is crucial for translating technological adoption into sustainable, inclusive economic growth in Africa.

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