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Research Paper

Diagnosing Indonesia's Digital Connectivity Deficit: A Comparative Policy Analysis of the High-Cost and Low-Quality Paradox

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Abstract

Indonesia stands at a critical interlude in its digital transformation. Despite achieving a high internet penetration rate of 79.5%, the nation exhibits a "quality paradox": consumers pay more for slower, less reliable internet compared to their ASEAN peers. This study employs a qualitative comparative analysis of secondary data, applying a Comparative Market Analysis and a structured Peer-Aspiration Comparative Framework, to examine the structural factors associated with Indonesia's telecommunications performance deficit. The findings suggest that the lag in internet quality is associated with three interrelated structural conditions: geographic deployment constraints, regulatory spectrum scarcity (particularly the 3.5 GHz band), and an oligopolistic market structure. By benchmarking Indonesia against Vietnam as a developmental peer and South Korea as an aspirational model, this study identifies policy and investment directions for improving Indonesia's connectivity outcomes. It recommends that the government transition from an infrastructure builder to a market facilitator by reforming spectrum policies and enabling active infrastructure sharing, while telecommunication operators shift investments toward Quality of Experience (QoE). These directions aim to address the structural conditions underlying the digital participation ceiling and support Indonesia's transition toward meaningful, high-quality connectivity.

Keywords: *Qualitative Comparative Analysis, Telecommunications Market Structure, 5G Spectrum Policy, Network Infrastructure Sharing, Internet Affordability, Indonesia*

INTRODUCTION

As the world's fourth most populous nation and the largest economy in Southeast Asia, Indonesia occupies a strategically significant position in the global digital landscape. With 221 million internet users and a penetration rate of 79.5% as of early 2025 (Kemp, 2025), the country has largely resolved the first-order challenge of digital inclusion: access. However, a more rigorous examination of network quality metrics reveals a troubling structural paradox. While most of the population is technically online, the infrastructure supporting that connectivity is characterised by high costs, low speeds, and significant latency, effectively creating a "digital participation ceiling" that constrains the scope of economic activity that citizens and businesses can conduct online.

This paradox carries serious consequences for national competitiveness. High-value digital activities, cloud-based enterprise operations, real-time logistics management, e-commerce at scale, and remote service delivery require a quality of connectivity that Indonesia's current infrastructure broadly fails to provide. In a regional context where neighbouring economies are actively leveraging digital infrastructure to drive industrial productivity, Indonesia's connectivity shortfall functions not merely as a consumer inconvenience but as a structural impediment to economic advancement. The disparity is most sharply illustrated by comparative pricing: Indonesian consumers pay an average of USD 0.41 per Mbps for fixed broadband, more than eight times the equivalent cost in Vietnam (USD 0.05 per Mbps), yet receive significantly inferior speeds

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(ITU, 2024; Ookla, 2025).

The central argument of this paper is that Indonesia's internet quality deficit is not an inevitable consequence of its archipelagic geography or its stage of economic development. Rather, it is the product of specific and addressable structural inefficiencies: regulatory inaction on spectrum allocation, a market structure insufficiently competitive to incentivise network investment, and a capital deployment strategy by dominant operators that prioritises near-term profitability over long-term infrastructure quality. Evidence for this argument is found in the financial disclosures of Telkom Indonesia, the nation's dominant telecommunications group, which reveal a 28.4% decline in capital expenditure between 2022 and 2024, from Rp 34.16 trillion to Rp 24.45 trillion, even as consolidated revenues remained effectively stable at approximately Rp 150 trillion annually (Telkom Indonesia, 2025a). This pattern is consistent with investment-suppression behaviour that the Structure-Conduct-Performance literature associates with concentrated markets (Bain, 1956), though this study advances this as an interpretive proposition derived from secondary comparative analysis rather than a causally established claim.

The objectives of this study are threefold. First, it undertakes a systematic root cause diagnosis of the factors driving Indonesia's cost-quality imbalance. Second, it applies a formal Peer-Aspiration Comparative Framework, benchmarking Indonesia against Vietnam as a developmental peer and South Korea as a policy-driven aspiration model, to identify lessons transferable to the Indonesian context. Third, drawing from both diagnostic findings and comparative analysis, it proposes a concrete strategic roadmap addressing the responsibilities of both the government and the private sector in transitioning Indonesia from a model of passive connectivity to one of meaningful, high-quality digital experience.

This paper is structured as follows: Section 2 reviews the relevant theoretical and empirical literature; Section 3 details the research methodology; Section 4 presents the findings and discussion, including the comparative analysis and strategic roadmap; and Section 5 concludes with policy implications and directions for further research.

LITERATURE REVIEW

Theoretical Foundations: Digital Divide and the Second-Level Gap

The academic literature on digital connectivity distinguishes between two generations of the digital divide. The first-level divide concerns access, whether individuals can connect to the internet at all, while the second-level divide concerns quality, whether the connections available are sufficient to enable meaningful participation in the digital economy (van Dijk, 2006; Hargittai, 2002). Indonesia's recent trajectory has largely resolved the first-level divide through successive government infrastructure programmes, yet it has not adequately addressed the second-level problem. Previous studies have heavily documented the persistent access divide in Indonesia, particularly highlighting the disparity between urban centres and rural or 3T (frontier, outermost, and disadvantaged) regions (Hasmar, 2017; Kominfo, 2021; Widyanto & Hasibuan, 2014). However, policy discourse has been slower to transition toward quality metrics, resulting in a governance framework calibrated for access provision rather than for quality assurance.

Market Structure and the Structure-Conduct-Performance Paradigm

A substantial body of industrial organisation literature holds that market concentration exerts a direct negative effect on pricing and investment behaviour. The Structure-Conduct-Performance (SCP) paradigm, originating with Bain (1956) and subsequently developed across numerous empirical applications, posits that highly concentrated markets suppress competitive pressure, allowing dominant incumbents to charge supra-competitive prices and reduce capital investment without losing customers. In this study, the SCP paradigm is applied as an interpretive

lens in Section 4.2.3, where it informs the reading of Telkom Indonesia's declining CAPEX-to-revenue ratio: the pattern is interpreted as consistent with the investment-suppression behaviour that the paradigm associates with concentrated markets, rather than as evidence of product innovation or network optimisation. Studies on market structures indicate that a highly concentrated telecommunications market can suppress competition and drive up costs, as documented in analyses of Indonesia's internet service providers and fixed-line markets (Novera, 2020; Nugroho, 2022; Sari & Situmeang, 2022). With Telkomsel holding over 50% of mobile subscriber market share with 159.4 million subscribers in 2024 (Telkom Indonesia, 2025b) and IndiHome commanding approximately 67% of the fixed broadband subscriber market, Indonesia's telecommunications market exhibits the structural characteristics that the SCP framework associates with suboptimal consumer outcomes.

Infrastructure Sharing and Cost Reduction Models

Addressing the high CAPEX and OPEX associated with Indonesia's archipelagic topography requires a restructuring of the investment model. Research on network-sharing frameworks demonstrates that collaborative deployment models can substantially reduce per-operator infrastructure costs without degrading service quality. Mawardi (2019) and Hidayat (2020) analysed the regulatory and economic benefits of active network sharing models, particularly Multi-Operator Core Network (MOCN), finding that they can drastically reduce industry-wide CAPEX and OPEX. Beyond the upfront savings, data-driven maintenance and operational strategies maximise the reliability of shared infrastructure and minimise system downtime, a critical capability for sustainable long-term operations across extensive networks spanning geographically dispersed terrain (Medoh & Mbohwa, 2025). Despite this body of evidence, Indonesia has not yet mandated active infrastructure sharing at the policy level, leaving significant efficiency gains unrealised.

Spectrum Economics and 5G Deployment

The economics of mobile broadband are fundamentally shaped by spectrum availability. The 3.5 GHz band has emerged as the globally dominant mid-band frequency for 5G deployment, offering the combination of coverage range and data throughput that makes true 5G commercially viable. In markets where this band has been made available through timely spectrum auctions, such as South Korea and Vietnam, operators have been able to deploy high-capacity networks at acceptable marginal costs. In markets where the band remains occupied by satellite incumbents or subject to regulatory delay, operators are forced to use less efficient frequencies, resulting in higher marginal data delivery costs and inferior consumer outcomes (Opensignal, 2025; Mustakim, 2019). GSMA Intelligence (2023) estimates that unsustainably high spectrum pricing and allocation delays in Indonesia could result in the loss of up to USD 14 billion in GDP between 2024 and 2030, a figure that directly quantifies the economic stakes of continued regulatory inaction. Separately, the GSMA (2025) notes that 5G mid-band spectrum coverage in Indonesia remained at just 26% of the national population as of end-2024, despite the band's recognised strategic importance. In the analytical framework of this study, spectrum policy functions as the primary regulatory variable connecting the governance environment to pricing and performance outcomes, as examined in Section 4.2.2.

Quality of Experience as a Strategic Imperative

As digital services mature, the academic and industry literature has progressively shifted from Quality of Service (QoS), a network-centric measure of technical performance, to Quality of Experience (QoE), which encompasses the end-to-end user perception of service delivery.

Balancing tangible infrastructure elements with reliable service delivery is essential to ensure high user satisfaction and operational efficiency (Briones et al., 2025). For Indonesian telecommunications operators, the transition to a QoE-oriented approach requires not only capital investment in network infrastructure but also the strategic alignment of organisational priorities, including human capital development. As Ortiz et al. (2025) demonstrate, employee satisfaction and fair wage policies correlate strongly with operational efficiency and service excellence, suggesting that internal workforce strategies are inseparable from external service quality outcomes.

Research Gap

Despite these distinct areas of research, a critical synthesis gap remains. No prior study has systematically examined how geographical constraints, regulatory spectrum inaction, and market concentration collectively produce the specific Price-per-Mbps disparity observed in Indonesia relative to its regional peers. Furthermore, the existing literature lacks a formal comparative framework that positions Indonesia simultaneously against a developmental peer (for validation) and an aspirational model (for direction). The World Bank (2021) identifies cost and affordability, not access alone, as the binding constraint on fixed broadband adoption for 44% of Indonesian households, validating the shift from first-level to second-level analytical focus; yet no peer-reviewed study has operationalised this finding within a structured comparative policy framework. This paper addresses both gaps.

The four theoretical strands reviewed above are integrated into a unified analytical framework applied in Section 4. The second-level digital divide framework (van Dijk, 2006; Hargittai, 2002) establishes why connectivity quality, not merely access, is the relevant outcome variable for Indonesia at its current stage of digital development. The SCP paradigm (Bain, 1956) provides the interpretive lens for reading Telkom Indonesia's investment trajectory as a market structure outcome rather than a firm-specific decision. Spectrum economics (GSMA Intelligence, 2023, 2025; Mustakim, 2019) connects the regulatory environment to cost and coverage outcomes, establishing spectrum policy as the primary governance variable. QoE theory (Briones et al., 2025) then frames the operator-level strategic response required once structural conditions are reformed. Together, these four lenses constitute the diagnostic framework through which observed performance differentials are interpreted, and through which the comparative evidence from Vietnam and South Korea is translated into policy and strategic directions for Indonesia.

RESEARCH METHOD

This study employs qualitative comparative analysis (QCA) of secondary data to examine the structural determinants of Indonesia's telecommunications performance deficit. The methodological approach is interpretive rather than experimental: it does not test causality through statistical inference but seeks to identify and evaluate structural patterns by systematically comparing secondary data across multiple independent sources and national contexts. Claims advanced in the findings section are therefore framed as evidence-based interpretive propositions consistent with established theoretical frameworks, not as causally proven relationships:

Research Design and Epistemological Positioning

The study adopts a comparative case study design within a qualitative framework. This design is appropriate for policy-oriented research questions where the unit of analysis is a national telecommunications market and where the number of cases is small but theoretically purposive (Yin, 2018). The epistemological position is interpretivist: empirical patterns observed in secondary data are interpreted through the four theoretical lenses established in Section 2, the

second-level digital divide framework, the Structure-Conduct-Performance (SCP) paradigm, spectrum economics, and QoE theory, to generate analytical insights rather than generalisable causal laws.

Data Sources and Inclusion Criteria

Data inclusion follows three criteria: (1) source authority, data is accepted from recognised international benchmarking bodies, governmental regulatory agencies, peer-reviewed journals, and primary corporate disclosures; (2) comparability, performance metrics are accepted only where standardised methodology enables cross-national comparison; and (3) recency, data is drawn from 2019 to 2025 unless historical reference is analytically required.

Network performance data is sourced from the Speedtest Global Index (Ookla, 2025), which aggregates millions of consumer-initiated tests using a standardised methodology, enabling comparable measurement of real-world network performance across countries. Pricing and affordability data are drawn from the ITU's annual ICT affordability measurement report (ITU, 2024), which provides internationally standardised price basket comparisons across over 200 economies. This is corroborated by Visual Capitalist's cost-of-internet index (Parker, 2025), which sources from We Are Social's global digital survey data. Financial data for Indonesia's dominant operator is sourced directly from PT Telkom Indonesia's (Persero) Tbk. official financial highlights disclosures (Telkom Indonesia, 2025a), a primary corporate source. Regulatory and spectrum policy data is sourced from GSMA Intelligence institutional reports (GSMA Intelligence, 2023, 2025), the ITU regulatory data hub, Opensignal's ASEAN Digital Infrastructure analysis, and official Indonesian government ministry publications (Komdigi; SDPPI Kemkominfo). The World Bank's Indonesia flagship digital report (World Bank, 2021) and its December 2025 Indonesia Economic Prospects (World Bank, 2026) serve as institutional corroboration for the affordability and infrastructure investment dimensions. Media sources are used only to contextualise or corroborate data points that are independently established through institutional or academic sources.

Case Selection Criteria

Two benchmark countries are selected based on a theoretically purposive contrast. Vietnam is designated as the Peer benchmark on the grounds that it shares with Indonesia comparable GDP per capita, a developing-economy regulatory context, and geographic connectivity challenges, yet produces substantially superior connectivity outcomes. This selection enables the comparative analysis to isolate policy and market structure variables rather than economic development level as the explanatory factor. South Korea is designated as the Aspiration benchmark because it achieved world-leading broadband performance through a documented sequence of public infrastructure investment followed by competitive private extension, a policy pathway that is theoretically transferable to Indonesia's governance context.

Analytical Procedure

The analysis proceeds in three stages. First, a Comparative Market Analysis benchmarks Indonesia's performance across speed, cost, and coverage metrics against regional and global reference points to establish the empirical scope of the performance deficit. Second, a Structural Diagnosis applies the theoretical framework to identify the governance, market, and geographic factors that are plausibly associated with the observed deficit, drawing on both Indonesian primary data and international evidence. Third, the Peer-Aspiration Comparative Framework synthesises findings from the two benchmark cases across five dimensions, Regulatory Environment, Market Structure, Investment Model, Pricing Outcome, and Performance Outcome, to identify policy and strategic mechanisms that are both causally plausible and contextually transferable. Conclusions

drawn from this analysis are advanced as informed interpretive propositions based on consistent patterns across multiple independent data sources, not as definitively proven causal claims.

FINDINGS AND DISCUSSION

Comparative Market Analysis: Indonesia's Performance Deficit

Direct comparisons of network performance consistently position Indonesia near the lower boundary of ASEAN regional rankings. According to the June 2025 Speedtest Global Index, Indonesia ranks 9th among the nine ASEAN member states with available Speedtest data, recording a median fixed broadband download speed of 35.96 Mbps (Global Rank: 120th), compared to Vietnam's 232.75 Mbps (Global Rank: 19th) and Singapore's 393.15 Mbps (Global Rank: 1st). On mobile internet, Indonesia likewise ranks 9th among the same nine nations, with a median download speed of 41.24 Mbps (Global Rank: 87th) (Ookla, 2025). It should be noted that Myanmar is excluded from Tables 1 and 2 due to the absence of sufficient nationally representative data in the Ookla Speedtest Global Index for the June 2025 reference period. Timor-Leste is not included as it is not yet a full ASEAN member state. These figures are presented in full in Tables 1 and 2.

Table 1. ASEAN Mobile Internet Speed Rankings, June 2025

ASEAN Rank	Country	Median Download Speed (Mbps)	Global Rank
1	Brunei Darussalam	185.54	11
2	Singapore	159.10	15
3	Malaysia	156.55	17
4	Vietnam	148.64	19
5	Thailand	112.71	37
6	Philippines	60.21	63
7	Cambodia	52.98	76
8	Laos	42.24	84
9	**Indonesia**	**41.24**	**87**

Source: Ookla Speedtest Global Index (2025)

Note: Myanmar is excluded from this ranking due to insufficient nationally representative data in the Ookla Speedtest Global Index for the June 2025 reference period. Timor-Leste is not included as it is not yet a full ASEAN member state.

Table 2. ASEAN Fixed Broadband Internet Speed Rankings, June 2025

ASEAN Rank	Country	Median Download Speed (Mbps)	Global Rank
1	Singapore	393.15	1
2	Thailand	252.97	11
3	Vietnam	232.75	19
4	Malaysia	148.51	40
5	Philippines	108.44	54
6	Brunei Darussalam	80.79	85
7	Cambodia	48.50	106
8	Laos	45.45	111
9	**Indonesia**	**35.96**	**120**

Source: Ookla Speedtest Global Index (2025)

Note: Myanmar is excluded from this ranking due to insufficient nationally representative data in the

Ookla Speedtest Global Index for the June 2025 reference period. Timor-Leste is not included as it is not yet a full ASEAN member state.

The speed deficit is compounded by a severe affordability gap. The average monthly fixed broadband cost in Indonesia stands at USD 28.05, substantially higher than Vietnam's USD 8.72 per month. On a per-unit basis, the disparity is even more stark: Indonesian consumers pay an average of USD 0.41 per Mbps, compared to USD 0.05 per Mbps in Vietnam, effectively paying over eight times more for each unit of speed (ITU, 2024). Full comparative affordability data are presented in Table 3.

Table 3. Comparative Internet Affordability in ASEAN & Asia, 2025

Country	Average Monthly Fixed Broadband Cost (USD)	Average Cost per Mbps (USD)
Vietnam	$8.72	$0.05
Laos	$17.87	N/A
Myanmar	$20.56	N/A
Thailand	$22.56	N/A
Indonesia	**$28.05**	**$0.41**
Philippines	$35.55	N/A
Hong Kong	N/A	$0.39

Source: ITU (2024); Parker (2025)

The combination of high costs and low speeds places Indonesia in a uniquely disadvantaged position: it suffers from neither the advantage of low-cost mass access (as Vietnam does) nor the premium performance of high-investment economies (as South Korea and Singapore do). This positioning, high cost, low quality, constitutes the core of what this paper terms the High-Cost but Low-Quality Paradox.

Diagnosing the Root Causes

Indonesia's connectivity paradox is not a single-cause phenomenon. It emerges from an interconnected set of structural challenges that reinforce one another across geographic, regulatory, and market dimensions.

The Tyranny of Geography

As an archipelagic state comprising over 17,000 islands, Indonesia faces infrastructure deployment costs that are structurally higher than those faced by contiguous landmass economies. Terrestrial fibre rollout requires either sea-crossing submarine cables or expensive microwave bridging between islands, significantly increasing the unit cost of both middle-mile and last-mile infrastructure. The government has partially addressed the middle-mile problem through the Palapa Ring Project, a flagship initiative that provided backbone fibre connectivity across all provinces and regions (BAKTI Komdigi, n.d.). The Palapa Ring has been credited with reducing geographic isolation for the Indonesian internet, and its completion marked a genuine policy achievement in the national connectivity strategy (Komdigi, n.d.-b.).

However, the Palapa Ring addresses backbone connectivity, not the final-kilometre challenge of connecting individual households, businesses, and communities to that backbone. Last-mile broadband buildout remains commercially unviable for private operators in lower-density island communities without significant fiscal incentives, because the per-subscriber capital cost cannot be recovered at commercially sustainable prices in sparsely populated environments (KPPN

Watampone, 2024; SDPPI Kemkominfo, 2021). As a result, while the Palapa Ring has narrowed the geographic digital divide at the infrastructure level, the last-mile gap continues to widen the quality divide at the consumer level. An estimated 12,000 villages remained without 4G coverage as of 2022, underscoring the scale of the population without 4G coverage (Komdigi, n.d.-a.).

Regulatory Spectrum Scarcity

Spectrum policy represents the most directly addressable root cause in Indonesia's connectivity paradox. The 3.5 GHz frequency band, the globally recognised "sweet spot" for 5G deployment, offering the mid-band balance of geographic coverage and data throughput, remains occupied by satellite services in Indonesia. This occupation prevents mobile operators from deploying the high-capacity 5G infrastructure that underpins quality improvements in peer markets. Furthermore, key frequency bands with significant capacity and coverage value, specifically the 700 MHz and 2.6 GHz bands, have remained un-auctioned, forcing operators to rely on more spectrally inefficient legacy bands for expanding their networks (Opensignal, 2025; Mustakim, 2019). The result is a spectrum scarcity that is partly geographic in origin (satellite services with legacy rights) but is largely a product of regulatory inaction.

The economic consequences of this inaction are significant. Operators compelled to use inefficient spectrum bands must deploy a greater density of base transceiver stations to deliver equivalent coverage, increasing both CAPEX and OPEX per unit of delivered capacity. This elevated cost structure is likely reflected in consumer pricing, consistent with the cost-pass-through mechanisms that spectrum economics literature identifies in markets with limited competitive alternatives (GSMA Intelligence, 2023). A timely spectrum liberalisation policy, through transparent auction processes and a managed transition plan for satellite incumbents in the 3.5 GHz band, would create conditions for competitive network investment without requiring direct government capital deployment.

Oligopolistic Market Structure and Capital Withdrawal

The structure of Indonesia's telecommunications market amplifies the consequences of geographic and regulatory constraints. The mobile segment is effectively dominated by a single operator, with Telkomsel commanding 75.6% of the net profit market share following the consolidation that reduced the total number of significant competitors (Telkom Indonesia, 2025b; GSMA, 2024). In the fixed broadband market, Telkom Group's IndiHome product occupies a similarly dominant position. This concentration structurally limits the competitive pressure that would otherwise compel operators to improve quality and reduce prices to retain subscribers.

The financial disclosures of Telkom Indonesia, the parent entity of both Telkomsel and IndiHome, provide quantitative support for this argument. As reported in the company's financial highlights, consolidated CAPEX declined from Rp 34.16 trillion in 2022 to Rp 32.97 trillion in 2023, and further to Rp 24.45 trillion in 2024, a cumulative reduction of 28.4% over two years (Telkom Indonesia, 2025a). This CAPEX contraction occurred against a backdrop of effectively stable consolidated revenues, which were Rp 147.31 trillion in 2022, Rp 149.22 trillion in 2023, and Rp 149.97 trillion in 2024. Simultaneously, the operating profit margin remained broadly stable, at 26.9% in 2022, 29.7% in 2023, and 28.7% in 2024, indicating that profitability was preserved even as the capital investment base contracted sharply, a pattern more consistent with the prioritisation of margins over network reinvestment than with a temporary, deliberate reorientation.

Table 4. Telkom Indonesia Key Financial Indicators, 2022–2024

Indicator (Rp Trillion)	2022	2023	2024
Total Revenues	147.31	149.22	149.97
EBITDA	78.99	77.58	75.58
Operating Profit	39.58	44.38	42.99
Capital Expenditure	**34.16**	**32.97**	**24.45**
Operating Profit Margin (%)	26.9%	29.7%	28.7%

Source: Telkom Indonesia Financial Highlights (2025a)

The CAPEX-to-revenue ratio, a standard indicator of an operator's commitment to network investment, declined from 23.2% in 2022 to 16.3% in 2024. In the context of a concentrated market with limited competitive pressure, this trajectory is consistent with the investment-suppression pattern that the SCP paradigm associates with dominant firms facing reduced competitive threats, where sustaining capital expenditure to grow or improve network quality becomes a lower-priority decision than maintaining margins. This pattern is advanced here as an interpretive observation aligned with theoretical predictions and is noted as a factor that may constrain the industry's ability to address the speed and reliability deficits identified in the comparative market analysis.

International Benchmarks: The Peer-Aspiration Comparative Framework

To translate the root cause diagnosis into actionable strategic directions, this section applies the Peer-Aspiration Comparative Framework to examine how Vietnam and South Korea have addressed analogous structural challenges through distinct policy and market models.

Vietnam: The State-Directed Competition Model

Vietnam presents a compelling peer comparison for Indonesia because it operates within broadly similar economic constraints, a developing economy with significant geographic connectivity challenges, yet produces dramatically superior connectivity outcomes. The critical differentiating variable is the model of state-directed competition that Vietnam employs.

Vietnam's telecommunications sector is dominated by state-owned enterprises: Viettel (military-owned) and VNPT (state-owned) together control approximately 95% of infrastructure and over 90% of subscriptions across mobile and fixed segments (U.S. Department of Commerce, 2024; ITU, 2024). Rather than functioning as a monopoly, however, this duopoly operates under government-directed competition, in which both entities are mandated to invest aggressively in infrastructure expansion, with performance targets tied to national digital development goals. Viettel alone has invested approximately USD 1.2 billion in developing its 5G network, and the government's National Digital Transformation Programme has established explicit targets for broadband fibre coverage at the household and commune level (U.S. Department of Commerce, 2024). The Ministry of Information and Communications (MIC) maintains an active spectrum management regime, with 4G coverage having reached 99.8% of Vietnam's territory by 2021 and 5G rollout progressing in 40 of 63 provinces and cities by 2023 (ITU, 2024).

The outcome is a fixed broadband market at USD 8.72 per month, affordable enough for mass-market adoption across a developing economy driven by state-enterprise operators whose mandate extends beyond commercial profitability to national infrastructure goals. Vietnam's example demonstrates that a developing country with limited private capital can achieve highly competitive connectivity outcomes when the regulatory framework treats infrastructure investment as a public good rather than purely a private business decision.

South Korea: The Public-Private Synergy Model

South Korea serves as the aspirational benchmark because it illustrates the long-run potential of a policy architecture that combines decisive initial public investment with a regulatory environment that sustains private competition over time. The foundational intervention was the Korea Information Infrastructure (KII) initiative launched in the 1990s, through which the government committed substantial public capital to build a national broadband backbone, effectively solving the coordination failure that prevents private operators from committing to large-scale infrastructure investment in the absence of guaranteed returns. This initial public investment served as a catalyst: once the backbone infrastructure was established, private operators competed aggressively to capture subscribers by extending FTTH (Fibre-to-the-Home) connections, densifying mobile networks, and improving quality (Lee, 2009; Shin, 2012).

The result of this two-phase model: public backbone investment followed by competitive private extension, is the world-leading network performance that South Korea sustains today: consistently ranked among the top five globally for both mobile and fixed broadband speeds, with a highly competitive market that continues to drive technological adoption (5G commercialisation at scale, ultra-low-latency services). The Korean model is particularly instructive because it did not rely on permanent state subsidy of operations; rather, it used time-limited public capital to create the conditions in which private competition could function effectively. For Indonesia, the South Korean precedent validates the proposition that government intervention at the structural level: spectrum reform, backbone investment, infrastructure sharing mandates, is not a substitute for market competition but a prerequisite for it.

Comparative Framework Summary

Table 5 presents the five-dimensional comparative analysis across Indonesia, Vietnam, and South Korea.

Table 5. Peer-Aspiration Comparative Framework: Indonesia, Vietnam, and South Korea

Dimension	Indonesia	Vietnam (Peer)	South Korea (Aspiration)
Regulatory Environment	**Spectrum scarcity; 3.5 GHz occupied; 700 MHz/2.6 GHz un-auctioned**	Active spectrum management; 4G at 99.8% territory coverage; 5G rollout underway	Strong regulatory agency; competitive spectrum auctions; proactive 5G licensing
Market Structure	**Oligopoly; Telkomsel ~75.6% net profit share; limited competitive pressure**	State-directed duopoly (Viettel + VNPT); government mandates competitive investment	Competitive market with multiple major operators; strong anti-monopoly enforcement
Investment Model	**CAPEX declining 28.4% (2022–2024); CAPEX/revenue ratio 16.3% (2024)**	State-enterprise mandated investment; Viettel USD 1.2B in 5G alone	Public backbone investment (KII) triggered private FTTH and 5G competition
Pricing Outcome	**USD 28.05/month; USD 0.41/Mbps**	USD 8.72/month; USD 0.05/Mbps	Globally competitive pricing driven by active market competition

Performance Outcome	**35.96 Mbps fixed (ASEAN rank 9); 41.24 Mbps mobile (ASEAN rank 9)**	232.75 Mbps fixed (ASEAN rank 3); 148.64 Mbps mobile (ASEAN rank 4)	Consistently top 5 globally across both fixed and mobile categories

The comparative analysis reveals that Indonesia's underperformance is neither a natural consequence of its development stage nor a function solely of geographic complexity. Vietnam, operating under similar economic constraints, achieves fixed broadband speeds more than six times faster at one-fifth the monthly cost. The differentiating variables are policy architecture and investment mandate, precisely the dimensions that are amenable to reform.

Strategic Roadmap

Drawing from the root cause diagnosis and the Peer-Aspiration Comparative Framework, this section proposes a two-pillar strategic roadmap. The roadmap assigns distinct but complementary responsibilities to government and to private-sector operators, recognising that structural reform at the policy level is a prerequisite for behavioural change at the operator level:

Government Policy Reform

The government's primary responsibility is to remove the structural constraints that suppress competitive investment, specifically in spectrum availability, infrastructure sharing regulation, and last-mile commercial viability support

In the near term (0–18 months), the government must prioritise the auction of the 700 MHz and 2.6 GHz spectrum bands, both of which offer significant capacity and coverage improvements, and which have remained un-auctioned without compelling regulatory justification. A transparent and competitive auction process for these bands would immediately expand the effective spectrum available to operators, reducing marginal data delivery costs and creating conditions for price competition. Simultaneously, the government should publish a concrete timeline and transition plan for clearing the 3.5 GHz band of satellite incumbents. Given the global strategic importance of this band for 5G, further delay carries escalating opportunity costs in terms of the productivity gains that true 5G infrastructure would enable (GSMA, 2025; Komdigi, n.d.-b.).

In the medium term (18–48 months), the government must enact regulatory provisions mandating active infrastructure sharing models, specifically MOCN (Multi-Operator Core Network), in designated geographic zones where the economics of independent network deployment are prohibitive. Hidayat (2020) and Mawardi (2019) have demonstrated that MOCN sharing can reduce per-operator CAPEX and OPEX substantially. A regulatory mandate, rather than a voluntary industry arrangement, is required because operators with existing network assets have limited commercial incentive to share infrastructure that represents a competitive moat. The government should also restructure the Universal Service Obligation (USO) fund to prioritise competitive tendering for last-mile connectivity in underserved regions, creating a pathway for smaller and regional operators to enter markets that the incumbent cannot profitably serve independently (KPPN Watampone, 2024).

In the longer term (48+ months), the government should evaluate the conditions for replicating elements of South Korea's public-private synergy model, specifically the use of targeted public investment in backbone infrastructure to catalyse private extension investment in 5G densification and FTTH. The Palapa Ring provides a structural precedent for this approach; what is now required is a second-generation programme focused not on geographic backbone coverage but on quality densification in economically active corridors.

Operator Strategic Shifts

The second pillar of the roadmap addresses the strategic orientation of private-sector operators, whose behaviour must shift from rent-extraction under oligopoly to collaborative value creation under a reformed regulatory regime.

The most consequential near-term shift is the adoption of collaborative economics through active infrastructure sharing. Research consistently demonstrates that operators implementing RAN sharing under MOCN achieve CAPEX and OPEX reductions of approximately 40–60% (Mawardi, 2019; Hidayat, 2020). Applied to Telkom's 2024 CAPEX base of Rp 24.45 trillion, even a conservative 40% efficiency improvement on shared network components would free up substantial capital for redeployment into quality-enhancing investments. These savings, reinvested into Fibre-to-the-Home expansion and network densification, would create a virtuous cycle: lower infrastructure costs reduce the minimum viable price point for quality broadband, expanding the addressable market and generating the subscriber growth needed to justify further investment. Real-world evidence from the Indonesian market supports this mechanism: following the Indosat-Hutchison merger and the consequent de facto MOCN integration, Indosat Ooredoo Hutchison (IOH) reported EBITDA growth of 40.2% in 2022, driven substantially by shared network efficiencies (Indosat Ooredoo Hutchison, 2022). This is the mechanism through which both Vietnam's state-enterprise operators and Indonesia's own merged operators have achieved simultaneous improvements in affordability and quality not by accepting lower returns, but by dramatically reducing the cost base through coordinated deployment.

The second operator imperative is a deliberate reorientation of investment strategy toward Quality of Experience rather than coverage extension alone. As digital services evolve, consumer switching behaviour is increasingly driven by service reliability and perceived performance rather than by geographic availability. Operators that invest in QoE, through network densification, latency optimisation, and service consistency, will be better positioned to capture the growing segment of high-value digital consumers and enterprise clients. This reorientation also carries internal workforce implications: as Ortiz et al. (2025) demonstrate, employee satisfaction and fair labour practices are significant determinants of operational excellence in service-intensive industries. Operators investing in network quality must simultaneously invest in the human capital required to manage and maintain increasingly complex infrastructure (Medoh & Mbohwa, 2025).

Finally, operators must recognise that the enablement of Indonesia's Industry 4.0 readiness represents both a civic responsibility and a commercial opportunity. Leveraging smart technologies: IoT-enabled network management, AI-driven predictive maintenance, and real-time data integration, enhances operational visibility and allows telecommunications providers to better manage widespread infrastructure, predict network demands, and preempt service disruptions (Mursyada et al., 2025). Operators that position themselves as digital infrastructure platforms rather than connectivity utilities will be better aligned with the trajectory of enterprise demand in a modernising economy.

CONCLUSIONS

Indonesia's telecommunications sector is trapped in a structurally self-reinforcing paradox: high consumer prices, inadequate infrastructure investment, and low network quality interact in the absence of competitive pressure or regulatory intervention. This study has identified three likely structural factors underlying this paradox, geographic deployment costs, regulatory spectrum scarcity, and investment suppression under market concentration, and has demonstrated, through the Peer-Aspiration Comparative Framework, that each is plausibly addressable through targeted policy and market reform. Vietnam illustrates that developing-economy pricing and high network performance can coexist when the regulatory framework treats

infrastructure investment as a national mandate. South Korea demonstrates that time-limited public investment catalysts can transform market structure in ways that sustain long-run private competition and quality improvement.

The proposed strategic roadmap assigns actionable responsibilities to both government and private-sector actors across near-, medium-, and long-term horizons. In essence, the government must act as a market architect: liberating spectrum, mandating infrastructure sharing, and restructuring the USO fund, while operators must shift from rent-extraction behaviour toward collaborative economics and quality-led competition. The two imperatives are mutually reinforcing: regulatory reform without operator commitment produces infrastructure without uptake, while operator willingness without a reformed regulatory environment remains structurally constrained.

Theoretically, this study contributes to the second-level digital divide literature by demonstrating that market structure and spectrum policy, rather than geography alone, function as primary mediating variables between infrastructure investment levels and quality outcomes in an archipelagic developing economy. It extends the SCP paradigm's application to a multi-causal telecommunications context in which spectrum economics and infrastructure sharing theory operate as complementary analytical lenses. The Peer-Aspiration Comparative Framework introduced here also offers a replicable methodological structure for policy-oriented benchmarking research in comparable emerging-market telecommunications contexts.

If these structural reforms are delayed, Indonesia faces the risk of a "*Digital Middle-Income Trap*", a condition in which the country's connectivity infrastructure becomes structurally inadequate for the demands of the next stage of economic development, limiting participation in global digital value chains and constraining the productive value of the digital economy investments that households, businesses, and the government are already making. The social contract required to avoid this outcome involves the government accepting its role as a market facilitator and regulator rather than simply an infrastructure builder, and operators accepting that long-term enterprise value is better served by expanding the digital economy than by extracting rents from a constrained one. Furthermore, the integration of smart digital capabilities: IoT, AI-driven network management, and real-time data analytics into the expansion of physical connectivity represents a critical next step for realising Indonesia's full Industry 4.0 potential (Mursyada et al., 2025).

LIMITATION & FURTHER RESEARCH

This study operates within several defined scope boundaries that future research should seek to address. First, its primary focus on downstream consumer performance metrics (speed and price) and midstream infrastructure policy does not capture the full complexity of the telecommunications value chain. In particular, the upstream proprietary financial data of individual operators, precise BTS unit costs, spectrum acquisition prices, network topology investments, and per-region ARPU are not publicly available at the level of granularity needed for rigorous econometric modelling. Access to such data would enable more precise quantification of the causal relationship between spectrum availability, competitive structure, and consumer pricing.

Second, the comparative framework, while structured and systematic, relies on country-level aggregate data. Indonesia's internal heterogeneity, in which urban Java operates under effectively different connectivity conditions than Eastern Indonesia or the 3T (*Tertinggal, Terdepan, dan Terluar*) as isolated regions, means that national averages obscure important subnational variation. Further research should apply the Price-per-Mbps and network quality analysis at the provincial or district level to identify where the paradox is most acute and where targeted interventions would yield the greatest welfare impact.

Third, this study does not model the dynamic economic effects of proposed interventions,

specifically the consumer surplus gains and GDP contribution impacts of improved connectivity. Future quantitative research should test the precise economic impact of spectrum auctions on localised consumer pricing models, leveraging natural experiment methodologies applied to regions where spectrum changes have occurred. Additionally, the specific operational dynamics of MOCN-model infrastructure sharing within Indonesia's unique island topographies merit dedicated empirical investigation, as the cost reduction estimates available in the existing literature are drawn from continental network environments that may not accurately reflect archipelagic deployment conditions.

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