

Cloud and Digital Public Infrastructure

ATTN 2025

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Engine of Growth

MSMEs are the Engine of growth

It represents 97% of ASEAN enterprises, employing 67% workforce, contributing 40.5% GDP, 19.2% exports (ADB 2021), but face significant challenges to be a part of the global supply chain.

MSMEs pay 2-3x higher fees than large corporations for the same services

Cross-border payment costs: 6-7% for MSMEs vs. 1-2% for large firms

Credit access: Only a small percent of MSMEs have formal financing

Therefore, viable entrepreneurs are trapped below their potential.

Therefore, MSMEs need special attention.

Growth needs to be inclusive

Challenges faced by ASEAN MSMEs

Considering the research output of ADB, World Bank, OECD, ERIA, and national statistical agencies, we have identified **34 Specific Challenges Across 8 Major Categories** that ASEAN MSMEs face.

| Category | Number of Challenges | Percentage Affected | Primary Sources |
|-------------------------|----------------------|---------------------|--|
| Access to Finance | 5 | 40-60% of MSMEs | ADB (2023), World Bank-IFC (2025), IMF (2024), Yoshino (2016, 2018) |
| Business Operations | 5 | 60-80% of MSMEs | Statistics Indonesia (2019), World Bank, Takeda et al. (2022), DTI Philippines |
| Technology & Digital | 5 | 70-88% of MSMEs | ERIA Digital Divide Report (2024), ASEAN Digital Study (2018), RedSeer |
| Human Capital & Skills | 4 | 80-85% of MSMEs | ILO, ERIA (2024), Asia Foundation (2025), World Bank Enterprise Surveys |
| Infrastructure | 4 | 85% of MSMEs | World Bank Logistics Reports, NITI Aayog (2023), ASSOCHAM, ONDC |
| Market Access | 4 | 60-80% of MSMEs | WEF, ASEAN statistics, New Zealand MFAT, IMF country studies |
| Regulatory & Compliance | 4 | 50-70% of MSMEs | OECD (2018), NITI Aayog (2023), Philippines Compliance Cost Study (2021) |
| Knowledge & Information | 3 | 60-70% of MSMEs | ASEAN-ERIA studies, Yoshino (2016), Asia Foundation reports |
| TOTAL | 34 | | Multiple international organizations and research institutions |

Source: Author's Compilation

No single intervention can unlock inclusive growth

Cloud Solutions

| Challenge Category | Number of Cloud Solutions | Key Impact Areas |
|---------------------------|----------------------------------|---|
| Access to Finance | 6 solutions | Alternative credit scoring, invoice financing, trade finance digitization, payment automation |
| Technology & Digital | 6 solutions | AI/ML democratization, managed services, enterprise security, payment orchestration |
| Business Operations | 5 solutions | Productivity tools, cash flow management, business intelligence, marketing automation |
| Human Capital & Skills | 4 solutions | E-learning platforms, remote work enablement, automation, collaboration tools |
| Infrastructure | 4 solutions | Offline-first apps, logistics optimization, shared warehousing, power independence |
| Market Access | 4 solutions | E-commerce platforms, quality management, supply chain integration, analytics |
| Regulatory & Compliance | 4 solutions | Compliance automation, document management, tax automation, invoice tracking |
| Knowledge & Information | 3 solutions | Data aggregation, translation services, AI chatbots, knowledge portals |

Challenges in adopting cloud

1. Limited Knowledge and Awareness (including lack of trust and understanding of the benefits)
2. Shortage of Cloud Computing Skills and Expertise (migration, operation etc)
3. Poor Internet Connectivity and Instability
4. The cost of cloud computing services is relatively high in developing countries
5. Data Security and Privacy Concerns
6. User Resistance to Change
7. Lack of Comprehensive Adoption Preparation

So, the real question is whether countries already have the right foundation, DPI, to make those cloud investments work effectively.

Cloud or Digital Public Infrastructure (DPI)?

Both Cloud Computing (CC) and Digital Public Infrastructure (DPI) constitute **complementary layers** of the digital economy.

Cloud as a Productivity Equaliser-Cloud computing converts capital expenditure into operational expenditure, enabling even microenterprises to access enterprise-grade IT infrastructure. This pay-as-you-go elasticity allows MSMEs to scale dynamically.

DPI as an Inclusion Multiplier-DPI integrates digital identity (ID), payment, and data-sharing into a unified ecosystem.

if fiscal capacity and institutional maturity are constrained, policymakers must decide the optimal sequencing of investments.

Initially, DPI creates foundational network externalities (e.g., digital identity, trust, and connectivity) upon which cloud-based private innovations can build.


DPI systematically removes the structural barriers that exclude MSMEs and vulnerable groups from participating in digital commerce.

-Public-Good Nature and Market Failure Correction

-Inclusion and Trust Foundation(Verified digital identity)

-At the initial stage, it provides Fiscal and Institutional Leverage(lowers transaction and verification costs)

Major Elements of Digital Public Infrastructure

 **Digital Identity Systems** - Unique identification for citizens (e.g., Aadhaar in India, e-ID in Estonia)


- Authentication and verification mechanisms

 **Fiscal ID / E-invoicing**


E-invoicing and linked fiscal IDs

 **Cloud Infrastructure**

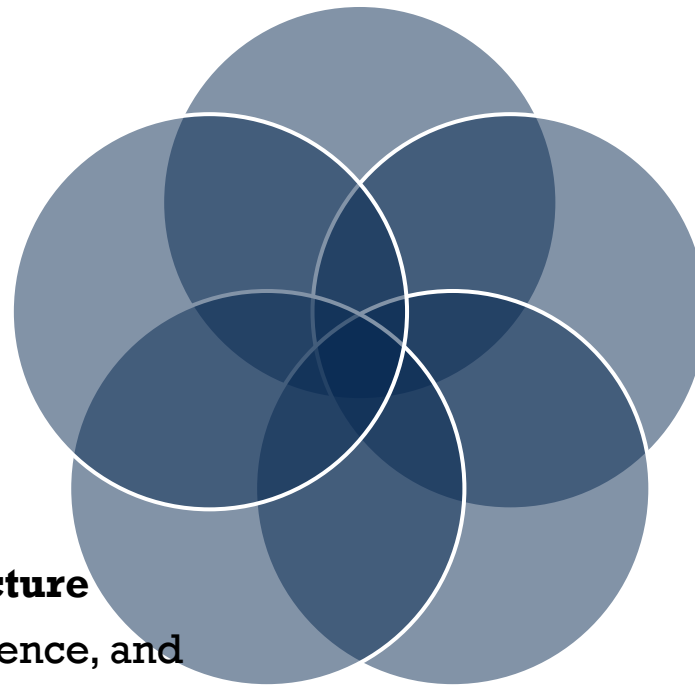
- ensures scalability, resilience, and accessibility.

 **Digital Payments Infrastructure**- Real-time payment systems (e.g., UPI in India, Pix in Brazil)

- Interoperable financial transaction platforms

 **Data Exchange & Consent Frameworks** - Secure data sharing protocols (e.g., India's Account Aggregator framework)

- User-controlled consent mechanisms

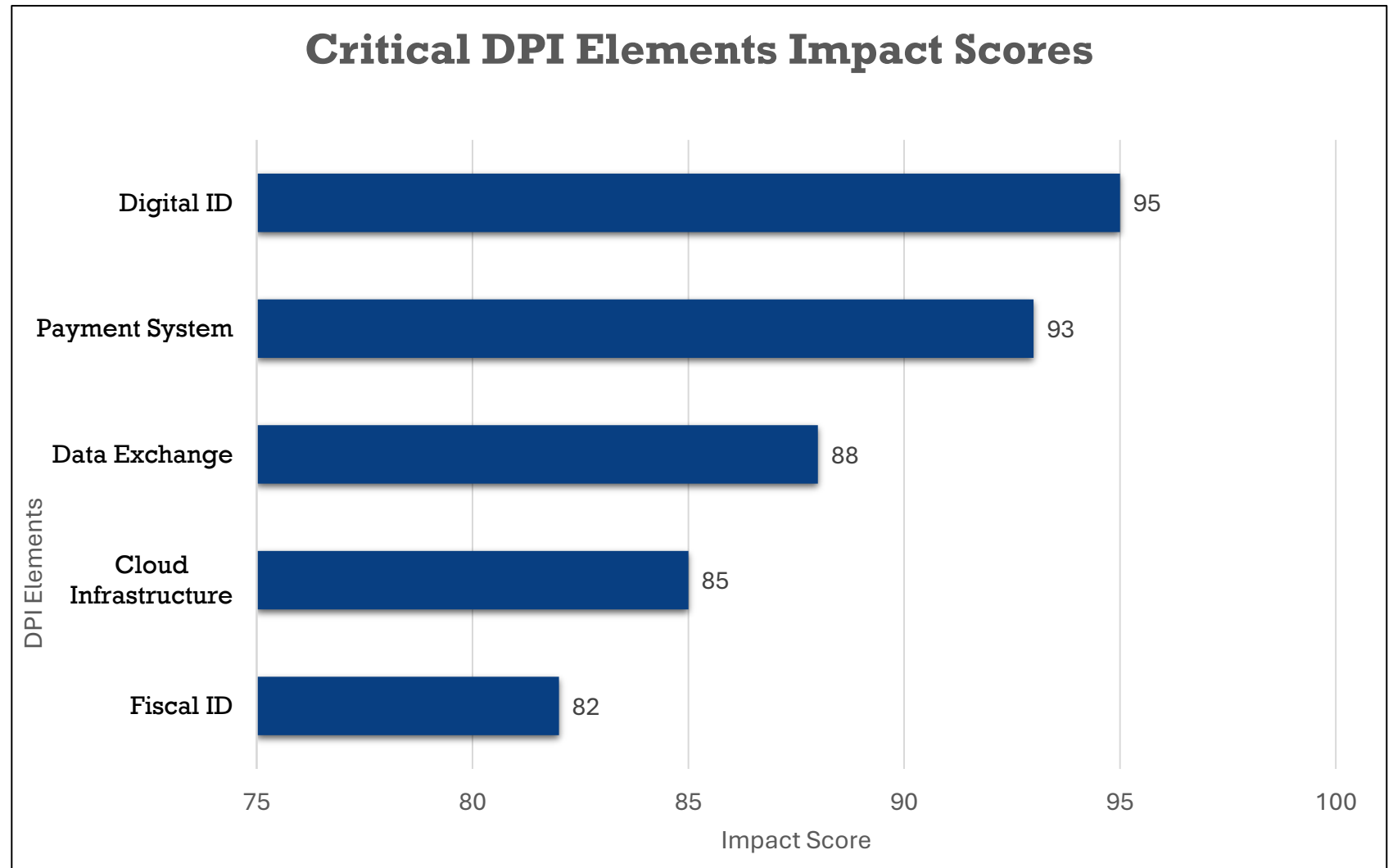


DPI Elements Impact Score

Based on a **meta-analysis** of international reports, regional policy studies, peer-reviewed literature, and statistical indicators from leading organisations.

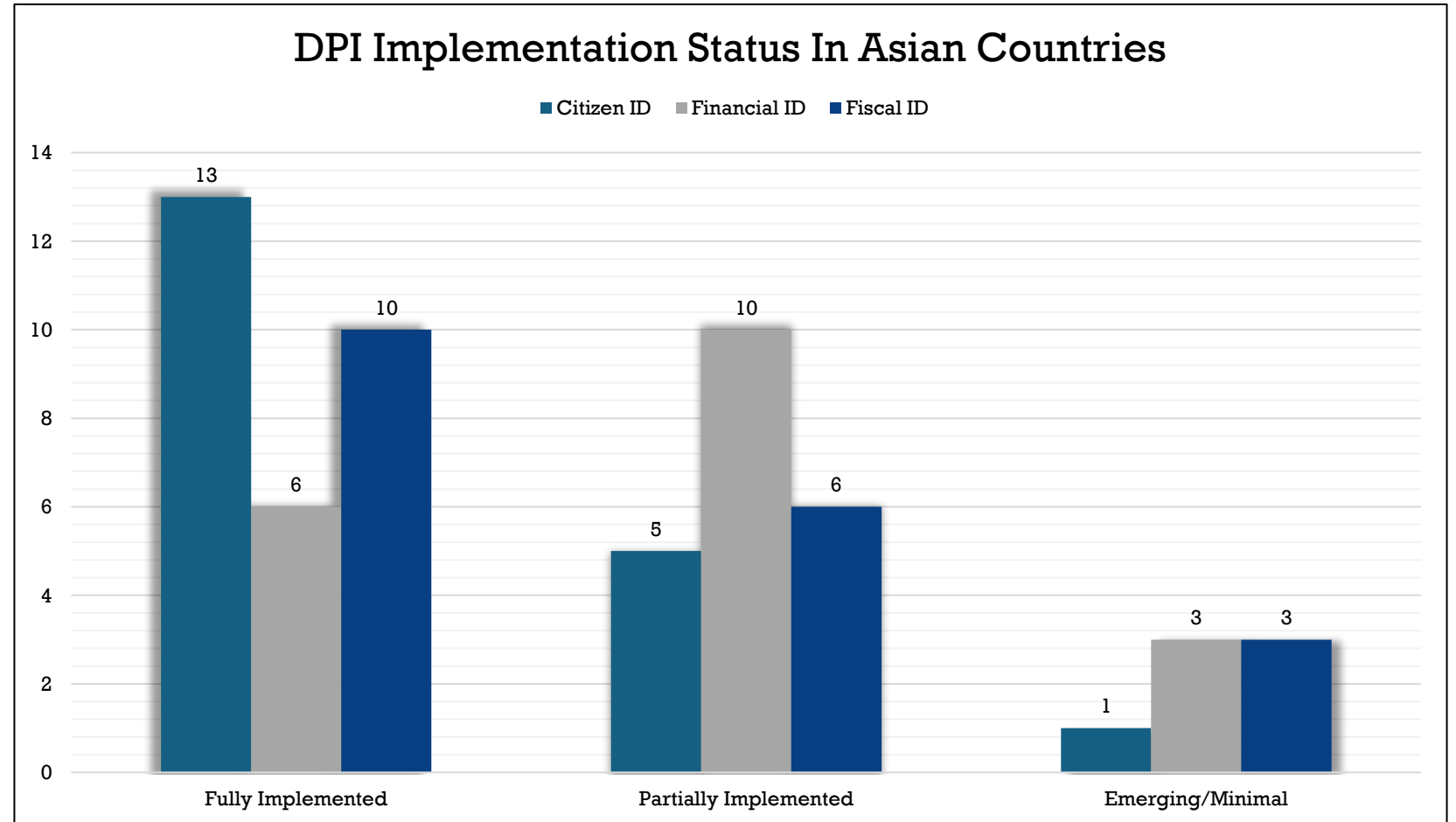
We have created “**DPI Impact Scores**”

Digital Identity and Payment Systems are most critical for enabling MSME participation in digital trade, with scores of 95 and 93, respectively.



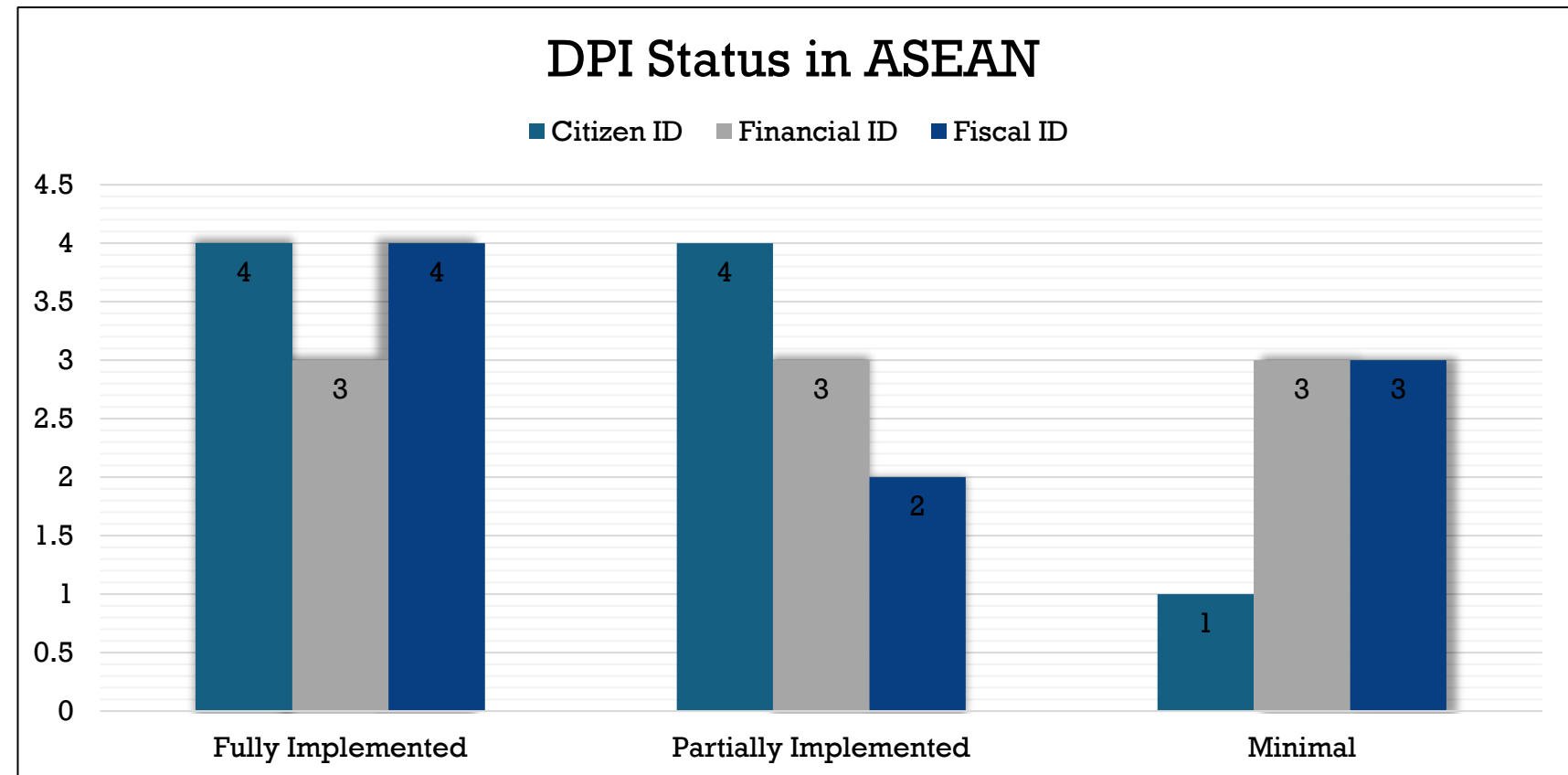
DPI Implementation Status

This reveals the critical gap: while 11 countries have fully implemented Citizen ID, only 6 have advanced Financial ID frameworks - highlighting where policy attention is needed.



DPI Implementation Status- ASEAN

A number of ASEAN countries are still lagging behind.



Systemic Constraints To DPI Scalability And Sustainability

Cross-Ministry Coordination Failures: DPI spans finance (RBI/central bank), identity (interior ministry), commerce (trade ministry), technology (IT ministry)

Regulatory Capture & Institutional Resistance: Incumbent financial institutions (banks) resist open banking/payment interoperability

Massive Upfront Capital Requirements: Many countries are already strained by debt, poverty, and healthcare. Furthermore, many governments prioritised politically visible projects. In this regard, development partner funding is also inadequate as DPI requires a public good model (low/zero user fees), which conflicts with loan conditions (privatisation, cost recovery).

Sustainability & Operational Costs: while Building DPI is 30% of the cost, 70% is operational maintenance/upgrade. Therefore, the government requires an adequate budget for it.

Data Dependency: DPI concentrates data. Therefore, there is a need for an interoperability standard, cybersecurity infrastructure, and expertise.

Strategic Pathways for Sustainable and Inclusive DPI Investment in ASEAN

Strategy 1: Develop Inclusive Policy Frameworks with Targeted Subsidies and Mandates

ASEAN can embed MSME and rural priorities into national and regional policies, mandating that a portion of DPI/cloud investments (e.g., 30-50%) targets underserved segments through subsidies, tax incentives, and localisation requirements.

Example: India (mandates 40% of DPI benefits for MSMEs/rural users via subsidies), EU (€20 billion in SME grants for cloud/DPI)

Strategy 2: Foster Public-Private Partnerships (PPPs) for Tailored Infrastructure and Training

PPPs can leverage private expertise to customise DPI/cloud solutions for MSMEs and rural contexts, with governments providing regulatory sandboxes and co-funding (e.g., 50:50 splits)

Example: Grab's Small Business Booster Program.

Strategy 3: Invest in Capacity Building and Digital Literacy Programs

A 62% skills gap requires ASEAN-wide training ecosystems that integrate DPI/cloud literacy into curricula and offer micro-credentials for rural MSMEs.

Example: Programs like Google's Gapura (training 4 million MSMEs by 2025) can be scaled via ASEAN's Human Resources Development Fund, targeting women-led rural businesses with localised content

Strategy 4: Promote Regional Cooperation and Harmonisation for Cross-Border Scalability

ASEAN can harmonise DPI standards via the Digital Economy Framework Agreement (DEFA) and Regional Payment Connectivity Initiative (RPCI), facilitating cross-border cloud access and data flows while mandating rural/MSME quotas in investments.

Strategies and Impacts

| Strategy | ASEAN Fit (e.g., Digital Economy Framework Agreement (DEFA)/Regional Payment Connectivity Initiative (RPCI) | MSME/Rural Impact | Global Example (Quantitative Gain) |
|-----------------------------|---|--------------------------|---|
| Inclusive Policies | Subsidies for rural broadband MSME-Specific Cloud Vouchers and Grants. Progressive loan terms for digitalisation. | 30-50% adoption rise | India: 36.5% MSME sales growth |
| PPPs | Grab Booster expansion Public-Private Partnership for Rural Connectivity | 20-30% revenue uplift | Brazil: 70% cost cut via Pix |
| Capacity Building | Gapura scaling(limited to Indonesia) | Bridge 62% skills gap | EU: 15% rural productivity gain |
| Regional Cooperation | ADII(ASEAN Digital Integration Index) benchmarking. RPCI for cross-border DPI | 20-30% cost reduction | Africa: 52% intra-trade boost |

Forward-Looking Agenda for ASEAN DPI Investment

- 1. Institutionalise DPI Governance within ASEAN Frameworks** – Establish ASEAN Digital Infrastructure Coordination Council (ADICC) under DEFA; create unified technical and regulatory standards for digital IDs, cybersecurity, and cross-border data sharing.
- 2. Mobilise Blended Finance and Regional Investment Facilities** – Launch ASEAN DPI Fund pooling contributions from ADB, AIIB, sovereign funds, and private investors; adopt public-good financing models.
- 3. Embed MSME and Rural Digital Inclusion Mandates** – Allocate at least 30% of resources to MSME and rural connectivity; integrate gender-responsive design and inclusive data governance.
- 4. Promote Regional Interoperability and Data Portability** – Operationalise cross-border digital ID and payment connectivity under RPCI and DEFA; develop ASEAN Data Mobility Framework.
- 5. Build a Human Capital Pipeline for DPI Sustainability** – Expand ASEAN's Digital Skills Recognition Framework (DSRF); establish a Digital Public Infrastructure Academy for capacity-building and exchange.

Key Outcomes Expected by 2030:

- reduction in MSME digital transaction costs
- increase in intra-ASEAN digital trade flows
- Universal interoperability across at least 8 member states
- 50 million new digitally integrated MSMEs

Thank You