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DPI's Unspoken Trade-Offs

**What Leaders Must Weigh
to Make Digital Rails Work
in Finance and Beyond**

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Summary

Digital public infrastructure (DPI) has become a centerpiece of digital transformation, with instant payments, digital IDs, and data-sharing initiatives reshaping how citizens and businesses access services. While celebrated for their speed and reach, these systems often advance faster than the evidence on their long-term effects. This brief argues that the success of DPI depends on managing trade-offs between three objectives: delivering public value, fostering market dynamism, and safeguarding system integrity. Drawing on examples from India, Brazil, and beyond, it highlights four tensions that recur across DPI projects:

- **Competition:** when infrastructure providers expand into downstream services, blurring the line between steward and participant

- **Trust:** when rapid adoption outpaces consumer protection, liability rules, and redress mechanisms

- **Sustainability:** when open-source and subsidized models lower costs but conceal long-term maintenance and governance challenges

- **Legitimacy:** when state-led systems risk political capture or sovereignty claims that tilt toward control rather than inclusion

The motivation is not to slow down DPI, but to improve its chances of delivering. By making trade-offs explicit, embedding safeguards, and treating DPI as systemically important infrastructure, governments and their partners can ensure these digital rails expand opportunity rather than simply rearrange risks.

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1 Momentum over Evidence

There is a great deal of interest around digital public infrastructure (DPI), and for good reason. In Estonia, the X-Road data exchange system has enabled seamless sharing of information across government agencies and with the private sector, powering everything from e-health to tax services. In India, a combination of digital ID and UPI has transformed access to services and enabled real-time payments at an unprecedented scale. In Brazil, Pix has rapidly expanded digital payments, even among informal and low-income users. Energized by these wins, governments are rolling out new platforms, and donors now back DPI as a cross-sector approach to digital transformation, from health and agriculture to education and AI, making it a central plank of inclusive digital development.

But the speed of adoption is moving faster than the evidence. DPI is still more vision than evidence-based practice, with countries' approaches diverging sharply on goals, governance, and revenue models (Eaves & Vasconcellos, 2025). The aim here is not to slow down or question the rationale for DPI, but to improve its chances of delivering by grounding design and operations in what works. We know too little about long-term effects on competition, consumer protection, and low-income users, and even less about how designs that thrive in tech-mature markets translate to places with thinner institutions and tighter budgets. Most proponents celebrate rollout speed while skimming over the trade-offs that decide whether digital rails expand opportunity or simply rearrange risk.

The gap between practice and understanding matters because every DPI build must juggle three objectives at once: creating broad public value, stimulating lively market competition, and maintaining uncompromised system integrity, as would be expected of any systemically important infrastructure. Neglect one objective and the other two will eventually suffer. Rather than divide into evangelists and skeptics, the field needs a sharper look at where those tensions surface and how to manage them. Large acceleration drives, including efforts to introduce DPI to dozens of new countries within just a few years, will succeed only if local capacity, governance, and trust keep pace with the technology.

2 Navigating the Three-Way Balance

Every digital rail aims to achieve three outcomes that rarely move in lockstep. Digital rails must deliver public value by reaching more citizens and small firms at lower cost; foster market dynamism so that private sector firms, both established and start-ups, keep developing better services; and preserve system integrity, which includes the trust, security, and financial resilience that make people comfortable shifting real money and personal data using the rail.

The tensions between these objectives are not flaws in DPI; they are features of any foundational system that aims to balance public purpose with private innovation. However, they must be made explicit to be understood and managed. Expecting any system to maximize all three objectives simultaneously is unrealistic; no country, not even more mature models implemented in Brazil or Estonia, have managed that. Rather, each DPI initiative should aim to achieve a workable balance

between goals and recalibrate this balance as circumstances evolve. Subsidies that push fees toward zero can widen access but also thin commercial margins and slow private investment, lowering the quality and security of the products. Tight central oversight may strengthen security yet risk muting competition if the overseer starts offering its own retail products. A rush to onboard every citizen quickly, without clear redress or liability rules, can boost usage metrics that suggest public value creation in the short run while eroding trust after the first large fraud wave in ways that undermine long-term usage. In other words, a gain at one vertex of the triangle (see figure below) can be paid for at another, and the true test of design is how consciously those trade-offs are made and revisited as the system scales.

This section discusses four emerging tensions between these three vertices: competition, trust, financial sustainability, and legitimacy. This is not an exhaustive list, but a starting map of the fault lines already visible. Treating them as living hypotheses and testing them with fresh evidence will be essential as the next wave of DPI projects moves from design to daily use.

PUBLIC VALUE
Inclusion, Affordability,
Consumer Protection

TRUST/LEGITIMACY TENSION

COMPETITION TENSION

SUSTAINABILITY TENSION

**SYSTEMS
INTEGRITY**

Cybersecurity,
Trust, Financial,
Operational
Sustainability

**MARKET
DYNAMISM**

Innovation,
Investment,
Competition
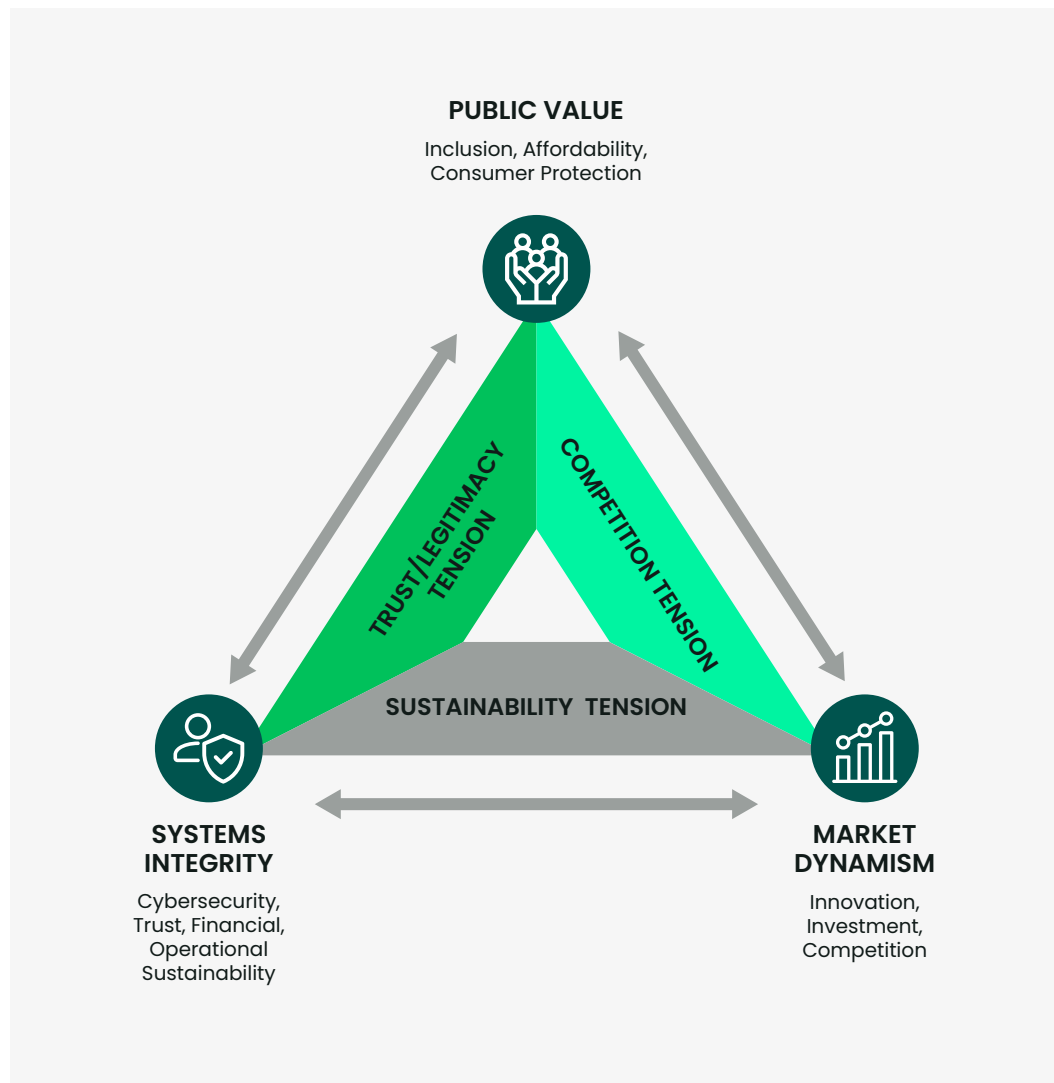
3 Competition Tension: When the Rail Becomes the Train

Tension: Public Value ⬅➡ Market Dynamism
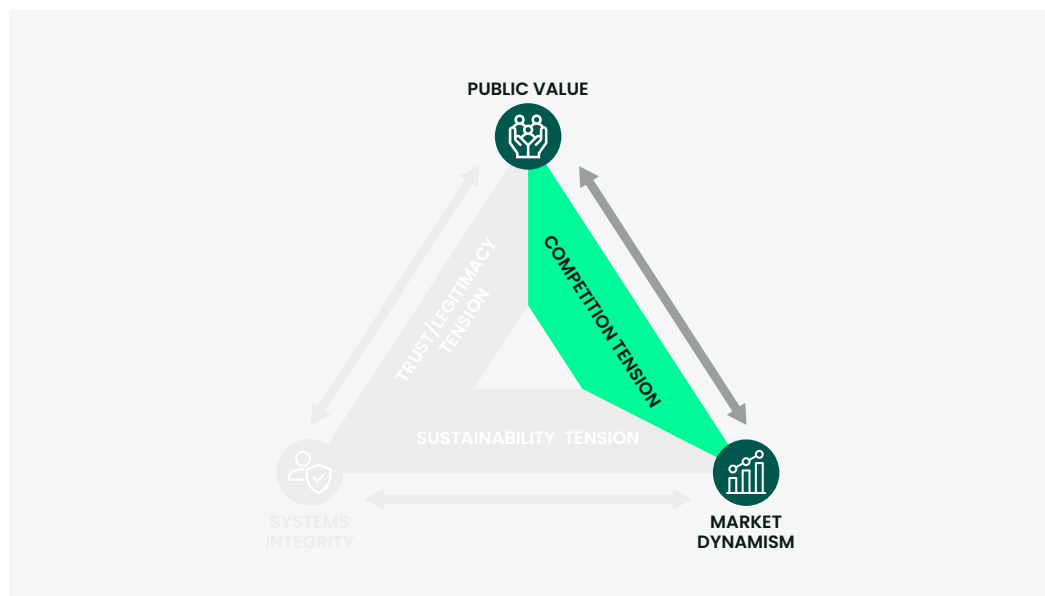
Digital public infrastructure is usually introduced as a provider-neutral, foundational layer — an open, interoperable, and modular infrastructure layer designed to reduce transaction costs and expand access. The premise is that DPI creates a level playing field for both public and private actors to build upon, without itself becoming a competitor in the market. This concern echoes the Universal DPI Safeguards Framework principle on maintaining market neutrality and promoting fair competition (UN ODET, 2024).

But in practice, we increasingly see the risk of a functional drift: DPI entities that begin as infrastructure providers gradually expand into adjacent or downstream services. Sometimes this occurs by necessity, for example, to demonstrate viability, fill early ecosystem gaps, or promote inclusion. In other cases, sovereignty motivations, whether framed in terms of data, digital, or monetary and financial sovereignty, also play a role. But

over time, it can blur the line between the roles of infrastructure steward and market participant, raising concerns about neutrality, concentration, and accountability.

India illustrates the complexity of keeping stewardship and competition cleanly separated. The National Payments Corporation of India (NPCI), set up in 2008 as a retail payments utility, launched Immediate Payment Service (IMPS) in 2010, the RuPay card scheme in 2012 (Bhakta, 2025a), and UPI in 2016; it also operates the BHIM UPI consumer app (Bhakta, 2025b), the Aadhaar Enabled Payment System (AePS), and Bharat BillPay, among other key functions. Backed by public incentives, this portfolio increasingly encroaches into markets served by private firms. To address concentration risk, the Reserve Bank of India in 2021 invited bids for a New Umbrella Entity to operate retail payments alongside NPCI, drawing consortia of large banks and tech firms;

the licensing has since been put on hold after RBI signaled the proposals fell short of its bar, leaving NPCI the sole nationwide operator for now (Bhushan, 2023). This has sparked debate about how the competitive landscape is evolving, particularly in a UPI ecosystem where two private apps account for more than 80 percent of transactions (Dey, 2024).

Several policy choices, often aimed at inclusion and lower costs, have shaped the current market dynamics. RuPay debit and UPI transactions carry a zero merchant discount rate policy that does not extend to other schemes, prompting Visa executives to warn regulators in 2021 that the playing field was tilting toward NPCI-branded cards (Kalra, 2021). Public sector banks are also required to issue RuPay on a preferential basis, helping the scheme capture roughly two-thirds of all new debit cards. Only RuPay credit cards can be linked to UPI, allowing NPCI's card network to tap the QR acceptance footprint built for UPI while other schemes are not eligible. The government's promotional budget for the BHIM wallet topped ₹900 million (USD $10 million) in its first year, a relatively modest amount that nevertheless signaled its role as a state-backed "public option" meant to guarantee baseline access to UPI (PIB Delhi, 2025). The allocation more than tripled over the following two years, underscoring the government's continued commitment to this role. Although BHIM's current transaction share is modest, it remains exempt from NPCI's 30 percent market share cap on third-party UPI apps, giving the in-house product room to expand even as private rivals are held to a ceiling and public sector banks continue to promote it by default[1].

Brazil offers a similar, though more nuanced, example. Pix has been celebrated at home by fintech founders and even hailed abroad by economist Paul Krugman as "the future of money," a public-run system that delivers instant, free transfers to three-quarters of the population (Krugman, 2025). Most objections have come from outside Brazil: the U.S. Trade Representative has launched a Section 301 investigation (USTR, 2025), arguing that Pix's regulatory setup disadvantages foreign payment firms, and Meta complains that WhatsApp Pay faced repeated regulatory delays, allowing Pix to consolidate its lead (Barreto, 2025). Any foundational rail produces winners and losers, and in Pix's first five years the clear winners have been local banks, fintechs, and consumers who were once underserved in the digital economy.

The next challenge is to build on Pix's success without narrowing the competitive field. Its growing integration into tax reporting and other government functions shows the Central Bank of Brazil shifting from neutral enabler to ecosystem orchestrator, a role that can be valuable as long as it does not encroach on areas already served by private providers. A range of new and upcoming features, such as Pix Garantido (guaranteed payments), Pix Automático (recurring payments), Pix Parcelado (installment payments), and receivables-based lending underscore the push toward value-added services layered directly on the rails[2]. Advocates say these additions close gaps for small merchants and keep fees near zero; critics counter that each new layer blurs the boundary between public infrastructure and private product, raising the risk of functional drift over time. How

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1 NPCI has extended the cap on volumes processed by UPI applications to December 2026. The extension aims to prevent slowing UPI growth and affects major players such as PhonePe and Google Pay. For more details see https://economictimes.indiatimes.com/tech/technology/npci-extends-upi-volume-cap-timeline-by-2-more-years/articleshow/116829131.cms

2 For more details, see (PagBrasil, 2024; Romani, 2025; Reuters, 2025).

Brazil manages that balance will offer an early signal of whether fast-growing DPI can remain both inclusive and genuinely open to market innovation.

ONDC (Open Network for Digital Commerce) in India illustrates a newer hybrid challenge. While framed as an interoperable protocol, ONDC has taken on market-making roles, subsidizing transactions, coordinating merchant onboarding, and relying on buyer apps such as Paytm that offer incentives to attract users; when these incentives were scaled back across apps (Economic Times, 2024), sales volumes fell (Rajan & Mukul, 2025). ONDC's behavior has in some instances resembled that of a commercial platform, blurring the distinction between protocol and product.

Supporters of this "functional drift" note that it can jump-start adoption. Where private players hesitate, a public or quasi-public actor can seed the network, prove use cases, and keep fees low for small merchants, much as state telecom incumbents once built basic voice coverage before competition took hold. Inclusion goals may justify a temporary product role, and governance buffers (non-profit charters, multi-stakeholder boards, published APIs) can in theory prevent outright favoritism. This pattern is not unique to DPI. In the private sector, startups often attract users with heavy subsidies or free services, only to recalibrate pricing as their customer base grows.

But history also shows how hard it is to unwind integration once network effects lock in. Once strong network effects take hold, reversing vertical integration becomes slow, politically charged, and technically complex. Unbundling a rail operator from its downstream businesses would require new governance structures, data-sharing protocols, and tariff rules, changes that can take years to negotiate and implement. During that period, the infrastructure operator's proximity to rule making and system data gives it an informational and timing edge over potential entrants, making it harder for new ideas to gain traction and ultimately slowing the pace of innovation.

One option is to introduce clear scope limits on what a DPI rail operator may build directly or adjacent to the infrastructure. Early U.S. ACH and ATM switches relied on this safeguard, and pre-IPO Visa and Mastercard did, too; their charters confined the network to core operations, leaving ancillary products to member banks. Updating that rule for today's state-run instant payment systems would help keep the rails neutral while allowing private actors to develop new services on top. The exact carve-outs should reflect each country's inclusion goals and regulatory capacity, but history shows that well-defined scope boundaries can protect competition without sacrificing public value.

Functional drift, then, is neither inevitable nor always harmful, but the risk is real enough to merit explicit safeguards. Early product forays should come with exit strategies, competitive neutrality rules (Capobianco & Christiansen, 2011), and independent oversight from day one. As private capacity grows, unbundling should become the default expectation, ensuring that the rails originally built to democratize access do not harden into a new barrier to competition.

4 Trust Tension: Recourse, Liability, and Security at Scale

Tension: Public Value ⬅➡ System Integrity
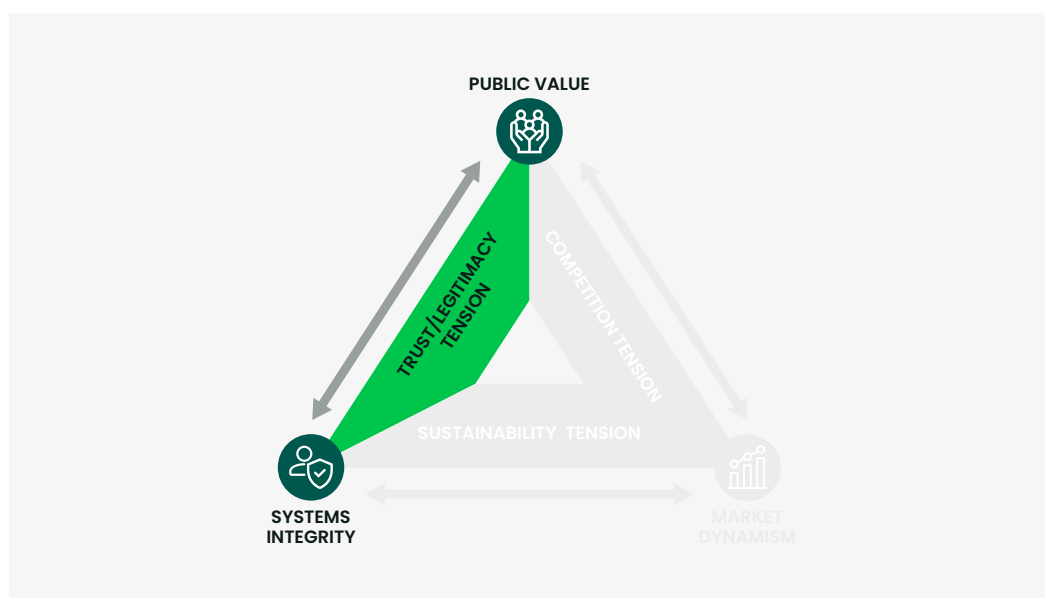
Digital rails widen opportunities for good actors and bad ones alike. As instant, irrevocable transfers become the norm, so do social engineering scams, spoofed QR codes, phishing that hijacks biometric credentials, and large-scale data leaks that feed fresh waves of fraud. What was once sporadic is now systemic. Banco Central do Brasil reports that losses tied to Pix fraud exceeded R$4.9 billion (USD $891 million) in 2024, a 70 percent jump in a single year (InfoMoney, 2025), with monthly fraud notifications averaging nearly 400,000 cases (Money Times, 2025). In India, a 2025 survey found that one in five families using UPI has experienced fraud since 2022, and a majority of victims never filed a complaint (Shukla, 2025), underscoring how thin formal redress mechanisms remain. Even in mature markets, the problem is acute: UK consumers lost £459 million (USD $610 million) to authorized push payment (APP) scams in 2024 alone, much of it tied to online purchases that never arrived (UK

Finance, 2023). New payment mechanisms tend to bring new forms of fraud, and because instant payment systems are reaching more vulnerable households, the risks are especially concentrated among those least able to absorb them.

When fraud strikes, liability is often unclear. Because preauthorized instant payments settle irrevocably within seconds, grounds for reversal are limited. Card networks absorb the cost of fraud through chargebacks funded by interchange fees, but most instant payment schemes launched without an equivalent safety net; finality is the default and victims are left to absorb the loss unless their bank volunteers a refund. Some regulators are moving; Brazil's Mecanismo Especial de Devolução obliges participating institutions to block suspicious Pix funds for up to 80 days and reimburse proven victims, effectively forcing the ecosystem to internalize fraud risk (Banco Central do Brasil, 2025). The Monetary Authority of

Singapore (2024) has gone further, issuing a Shared Responsibility Framework that allocates losses among consumers, banks, and telecom operators, and also pushes controls upstream by mandating stronger sender authentication and telco-level SMS filtering to stop phishing before money moves. The UK's new Faster Payments rules take a primarily post-event approach, compelling banks to reimburse most APP fraud losses within five working days. Market fixes are still thin. Cyber-insurance policies for small merchants remain niche and expensive, while private fraud analytics vendors struggle to cover informal segments.

A digital rail is only as inclusive as it is on its worst day. Unless liability rules, dispute resolution workflows, and shared fraud detection utilities are baked in from the start, every new scam reduces the network's social return. Regulators and scheme operators therefore need to treat consumer protection as core to the infrastructure, giving providers clear, predictable incentives to invest in joint security assets rather than simply push risk downstream. The long-term credibility of any DPI initiative will hinge less on how fast it scales than on how quickly, and fairly, it makes victims whole when things go wrong.

5 Sustainability Tension: Open Source and Unseen Costs

Tension: Market Dynamism ⬌ System Integrity
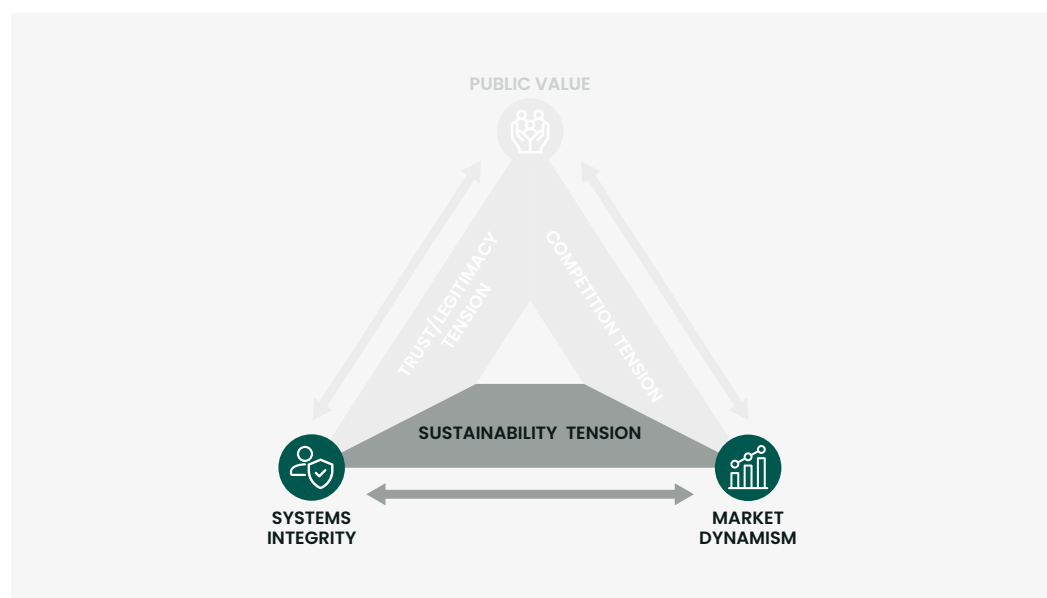
Open-source code sits at the heart of many new payment and data exchange projects. Mojaloop, for instance, now powers pilots or live instant payment schemes from Rwanda and Tanzania to the Philippines and Peru, offering governments a transparent, vendor-neutral alternative to proprietary

platforms. The World Bank (2025), in its Focus Note on Open-Source Fast Payment Systems, takes a balanced view: it applauds the openness and flexibility that projects such as Mojaloop bring, while cautioning that license savings can evaporate once integration, customization, and lifetime maintenance are counted,

and that the deep skills needed to harden and extend the code are often scarcest in the very markets most drawn to the model.

The upsides are clear. Open code lets regulators and civil society groups inspect security for themselves, encouraging local developers to tailor features, and avoids the "black box" opacity of fully proprietary stacks. Even when an open-source rail is delivered as a managed cloud service such as a "DPI-as-a-Service" hosted by an external provider, the source remains inspectable and can be redeployed on-premise if data sovereignty rules demand it. The Mojaloop Foundation notes a steady rise in community contributions and an active roadmap that now targets ISO 20022 messaging, real-time risk controls, and offline functionality, showing that a collaborative model can keep evolving and need not lapse into stasis.

Even so, three design questions remain. First, how will oversight of the open-source software be funded once donor grants taper off? Open-source communities thrive on volunteer energy, yet national payment rails require 24/7 uptime, professional security audits, and rapid incident response. Research by the Brookings Institution notes that many public interest open-source projects stall when maintenance budgets dry up, leaving governments to shoulder unplanned costs or fall back on proprietary vendors (Nagle, 2022). **Second,** who is accountable when something breaks? A dispersed community cannot be sued; the World Bank note therefore urges clear governance charters, with named maintainers and budgets for security reviews. A further challenge is the lack of regulatory clarity on open source, as many financial and competition regulators have yet to articulate positions on how it should be treated, which can limit confidence and slow adoption. **Third,** can smaller markets attract and keep the requisite talent? Where specialist skills must be imported, total costs can approach those of proprietary solutions; where they are absent, systems risk stagnation.

The existence of these trade-offs does not eliminate the promise of open source. Open-source success stories show that with robust governance and a healthy developer ecosystem, open code can run mission-critical services for decades (Cobar, 2023). For lower-capacity settings, the choice is less about "free versus paid" and more about budgeting for the unseen work, long-term funding, institutional ownership, dedicated maintainers, and clear liability rules that turn open code into durable public infrastructure.

Open source therefore remains a powerful option for operating digital rails, but not a silver bullet. Its greatest strength — transparent, adaptable code owned by the community — also demands the discipline of long-term stewardship: predictable budgets, clear lines of accountability, and a talent pipeline that can keep critical modules secure and up to date. Where those pieces are in place, open platforms can rival proprietary stacks while anchoring local innovation. Where they are missing, the same openness can expose governments to spiraling maintenance costs, security gaps, and stalled upgrades. The value of open source lies in its flexibility, but its adoption should remain a choice shaped by local capacity and priorities.

6 Legitimacy Tension: Shielding DPI from Political Capture

Tension: System Integrity ⬅➡ Public Value
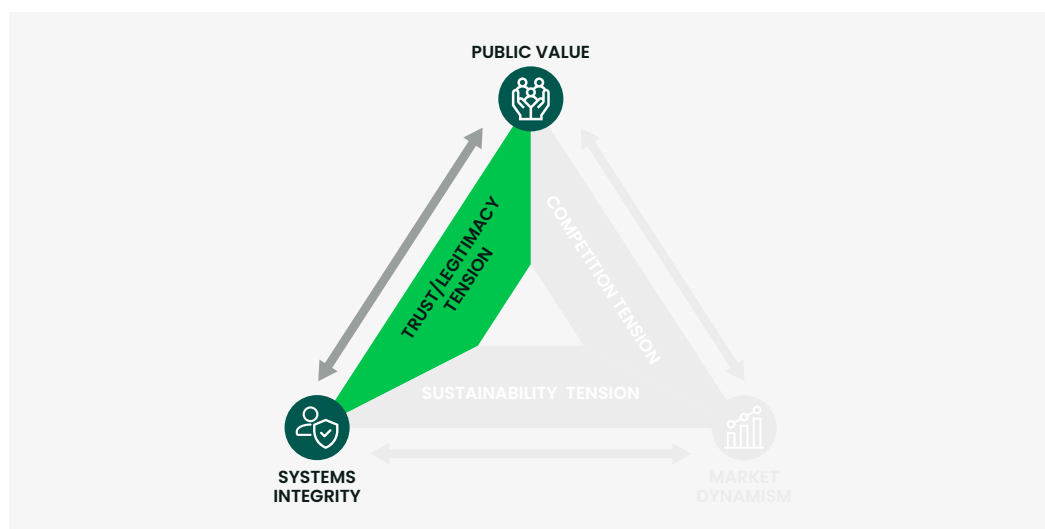
Digital public infrastructure does not operate in a political vacuum. Because DPI usually takes the form of national identity systems, central bank platforms, or flagship government programs, it can quickly become a lightning rod for political conflict or greater state control, for example, through illegal or unethical surveillance.

Kenya offers an early warning. Fieldwork by Zollman et al. found that the country's digital ID rollout stalled when citizens interpreted biometric enrollment as an extension of state scrutiny rather than a gateway to services (Zollman et al., 2024). Many interviewees said they would register only if they could see clear legal protections and an independent grievance path. Brazil shows another interesting example: research by Luciano and Fleck documents how false claims of a new "Pix tax" spread across WhatsApp and Facebook, reaching an estimated two-thirds of the electorate and becoming ammunition in the 2024 and 2025 election cycles (Luciano & Fleck, 2025).

Surveillance fears amplify the stakes. Analysts warn that the same infrastructure that streamlines service delivery can, without strict guardrails, entrench "digital authoritarianism" by giving governments an uninterrupted, granular view of citizens' lives (Gahnberg, 2024). China's newly announced unified digital ID program, unveiled this July, links biometric credentials to travel, payments, and social credit scoring, prompting international criticism that the platform could widen state monitoring (The Economist, 2025). Even in democracies, today's accountability may not survive tomorrow's administration; a dataset that records every citizen's movements or transactions could become a tempting treasure trove for governments wishing greater control.

These episodes suggest that some baseline of public confidence is needed to launch any DPI, but the system must also be built to deepen trust over time — confidence will not emerge automatically as a byproduct. If citizens

cannot rely on stable, transparent governance, or if they fear that the next government will weaponize the rails, the incentives to adopt, invest, and innovate collapse[3]. Designing DPI therefore means designing durable guardrails: independent oversight bodies, clear privacy statutes, and mechanisms to ring-fence critical infrastructure from partisan control. Without them, the promise of inclusive digital rails risks being derailed by the very politics they are meant to transcend.

7 Toward the Next-Generation DPI

The DPI movement will succeed in the long term only if it moves beyond counting launches to embedding a concern for impartial state stewardship, genuine market competition, and user-controlled data. Those ingredients are easiest to assemble where institutions are reliable, the rule of law is strong, technical talent is available, and a degree of public trust already exists, conditions that even well-resourced countries do not always meet. Where these enablers are weaker, DPI can still advance but needs heightened attention to the trade-offs outlined above; otherwise, the same architecture may amplify surveillance fears, crowd out private innovation, or leave governments with maintenance costs they cannot sustain. Yet global enthusiasm often outpaces such nuance; success stories from Estonia, India, and Brazil dominate the narrative, while implementation hurdles in lower-capacity settings rarely make the podium.

To start, the DPI agenda needs a disciplined and well-funded feedback loop that tracks real-world rollouts, records failure modes alongside breakthroughs, and surfaces hidden costs such as fraud remediation and long-term code stewardship. Funding for that loop must be built in from the start, not tacked on later. A practical benchmark would be for donors and multilaterals to ring-fence 5 to 10 percent of every DPI project funding for data gathering, independent evaluation, tracking consumer sentiment, and strengthening impact. Similar mechanisms are being implemented in other sectors. The Council of Europe Development Bank (2024), for example, recommends earmarking up to 5 percent of project costs for impact measurement and knowledge transfer, proving that large capital programs can hardwire learning into their finance plans. Initiatives such as the Global DPI Insights Community can help coordinate methods and share results, but they will only move the needle if this sort of systematic, well-resourced commitment becomes the norm.

Next, the competition tension calls for clear but context-sensitive limits on how far public or quasi-public operators may extend their offerings beyond the core rail. What belongs inside the infrastructure and what should be left to the market will differ by country, shaped by factors such as the maturity of the local tech sector, the depth of capital markets, levels of public trust, and the administrative capacity of the state. In low-capacity settings, a public actor may need temporary leeway to fill gaps with support from donors and international institutions; in more advanced markets, the same leeway can slide into scope creep and crowd out private investment. Whatever the starting point, mechanisms

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3 The Universal DPI Safeguards Framework highlights a series of structural vulnerabilities, including digital distrust and weak rule of law, that can undermine legitimacy if not proactively addressed. For more details, see https://dpi-safeguards-framework.org/frameworkpdf.

are needed to keep functional drift in check. Oversight could sit with a "public protector" function — an ombudsman-style body composed of technologists, economists, lawyers, and consumer advocates — that hears grievances across agencies and industry groups and enforces pro-competitive rules from the outset (Porteous, 2022).

Finally, DPI projects need a credible signal of inclusive governance and decision making. An independent scorecard, overseen by a consortium of public agencies, industry groups, consumer advocates, and civil society, could grade each DPI initiative on inclusive decision making, stakeholder consultation, consumer redress strength, and data protection rigor. Albeit with some challenges, similar tools already shape behavior elsewhere: Energy efficiency labels nudge appliance makers toward greener designs (IEA, n.d.), ESG (Avdogmus et al., 2022) and microfinance ratings (Cerise+SPTF, n.d.) steer capital toward higher-performing firms, and Mozilla's "Privacy Not Included" badge pushes device manufacturers to tighten security (Mozilla Foundation, n.d.). A comparable, annually updated dashboard for DPI would let donors, investors, and users compare initiatives at a glance while giving operators a reputational incentive to close governance gaps before the next review.

The conversation needs to move past champions on one side and critics on the other toward concrete safeguards anyone can test. If the next phase of DPI adoption pairs rigorous feedback loops and accountability mechanisms that make governance performance visible, then decisions will be driven less by raw speed and more by transparent evidence on what works, where, and why, allowing inclusive and trustworthy digital rails to become durable public assets. Without that discipline, momentum alone cannot protect citizens, or budgets, from the next avoidable misstep.

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