

Is DPI a useful category or a shiny new distraction?

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Summary

This paper explores the usefulness of the term Digital Public Infrastructure (DPI) as a new category descriptor. In order to reach any conclusion, I first reflect on whether there is yet sufficient clarity about its meaning. This question leads to an exploration of the space in which to locate the emerging existing definitions of DPI; and then on to the wider question of what is the appropriate combination of openness and certainty needed at this early stage of this field. The answer is driven by the purpose for which a definition is needed: for example, championing or investing or regulating it. The relatively rapid take-off of the term DPI reflects in part deeply felt but diverse hopes and fears about the emerging digital future, such that reconciling all these will not be easy; DPI alone is no magical fix. However, it is possible to pursue an emergent definitional path which starts broad and over time, rules out certain options as evidence gathers.

Definitional questions aside, there is already evidence of convergence in substance across different sectors that can make DPI a useful lens beyond the existing sectoral lenses alone. In addition, the DPI lens allows new questions to be asked, for example about whether the fragmented approach to regulatory architecture for data is adequate. The term DPI seems potentially useful therefore, but it will require some careful shepherding to avoid either the confinement of premature narrowness or the vacuousness of prolonged vagueness.

In 2004, a three-letter acronym was coined. The words represented by each letter were not new, but somehow, the combination ignited a spark of interest. Within a decade or so, the spark became a raging fire. Today, trillions of dollars are managed under mandates determined by varying interpretations of this acronym. It is now high on the agendas of the boards of many large public companies worldwide; and even smaller companies are considering how they should respond. Governments are passing laws which entrench different understandings of what it means. That acronym is, of course, “ESG” standing for Environment, Social and Governance factors affecting and affected by the private sector.² But close to 20 years later,

¹ The author is Founder of Integral: Governance Solutions. Prior drafts of this paper have benefited from discussion with colleagues in the new DPIx Forum and I thank them for this.

² The UN Global Compact introduced the term ESG in this statement which today seems self-evident, even innocuous: “A better inclusion of environmental, social and corporate governance (ESG) factors in

there is still no single accepted definition of what ESG means; but the term has gained enough traction even to generate a public backlash in some places in the past two years over some of its associated norms.

'DPI' standing for 'Digital Public Infrastructure' is also a three-letter acronym. First used in the past few years, it is not clear who coined it but it has already sparked interest in various quarters. DPI featured prominently in meetings of donors and governments at the September 2022 UN General Assembly. In the emerging public discourse, DPI is often presented as a close 'cousin' of Digital Public Goods (DPGs), which have themselves since 2019 become the basis of a major UN-coordinated and donor-backed push in support of the Sustainable Development Goals. But it is also increasingly on the agenda of research institutions, and even directly captured in the name of one: the new [Initiative for Digital Public Infrastructure](#) established at the University of Massachusetts in 2021.

But what does the term DPI really mean and how useful is it? The aim of this paper is not to propose yet another definition. Rather, it is to explore the emerging definitional space around DPI to build enough of a foundation on which to consider whether the term is in fact useful. The issue here is not semantics: rather, these questions take us to the root of the underlying drivers of the emerging digital world in which DPI is fast becoming an important public expression of the *zeitgeist*. As the example of ESG shows, a simple clear label which somehow triggers and channels underlying currents of sentiment can have very powerful effects over time. But if a term is vacuous and unclear, it may simply confuse and distract. **Which is DPI today—clear and useful; or vague and confusing? And even more importantly, what does it need to be?**

The starting point in this paper is to consider which problems DPI is trying to solve. This assessment is then the basis for defining the appropriate definitional space in which it may develop to address them. This paper also proposes some directions of further exploration and experimentation to shape the answer to the question of how useful the term really is.

What DPI is trying to solve for?

At the vaguest level of definitional specificity, one may say that the digital world is already full of digital public infrastructure: giant publicly accessible digital platforms like Facebook or Google dominate their respective niches of essential digital infrastructure provision. By this definition, the term DPI does nothing more than recognize what is already there. However, the rapid, recent emergence of the term DPI reflects a deeper hunger for something more than this. I believe it has been generated by the convergence of two underlying hopes or desires. The **first desire is to see patterns which help reduce the spiraling complexity of the digital world** so that we at least can feel like we have more agency in shaping it. The second is the

investment decisions will ultimately contribute to more stable and predictable markets, which is in the interest of all market actors”.

widespread hope to avoid the apparent default trajectory of the digital world, which seems to lead either to private monopolization or authoritarian control, with scant evidence so far that there is much in-between.³

While these underlying desires may have been accentuated by the pace of changes in the digital world, the questions surrounding DPI are not new. They are in some sense the next iteration of a long-standing economic policy question: **how to ensure the optimal supply of infrastructure for societal growth and flourishing?** Economists have long recognized the particular characteristics of physical infrastructure, including its lumpy and long-term investment profile and its public good characteristics, which often result in private under provision. However, governments have not always been good at filling the gap. Constrained by government capacity either to deliver or manage certain infrastructure and also to finance from the fiscus directly, recent decades have seen a shift towards reliance on public-private partnerships. While the nature of these partnerships varies widely, in general, state ownership and/or oversight creates a framework in which private provision can take place and be financed. The growing popularity of this approach to physical infrastructure has led to the creation of initiatives like the G20 [Global Infrastructure Hub](#).⁴

Moving across from the physical to the digital world, the push for a focus on DPI reflects a range of different underlying concerns. First, **a concern that the private sector will not deliver digital solutions widely or inclusively enough on its own**, exacerbating concerns about growing inequalities of income and wealth in many societies. This represents an evolution of the long-held concern about the effects of the digital divide between those who have digital connectivity and those who have not. This is primarily a **concern for equity**, linked to a developmental agenda. It is often tinged with fears that our digital future could be even more exclusive and divisive than it already is. Arising from this viewpoint, DPI as a solution set is mainly about enabling greater extension of access to merit goods such as those outlined in the SDGs—such as health, education, economic opportunities.

A second concern is in some ways the flip side of the first: namely, that the private sector will in fact deliver solutions widely but will do this by creating vast monopolies or quasi-monopolies which will impose long term economic costs in reduced dynamic efficiency through constrained innovation. This is a **concern for efficiency**, which appears to be buttressed by the evidence that a number of the strategic sectors within the digital economy—online search, operating systems, social media, cloud computing to name the most obvious—are dominated by at most a handful of “tech giants”. It is also tinged with fears that, quite apart from private rent extraction, private monopolies may accumulate disproportionate political power. Only the greater exercise

³ The reference to ‘scant’ is not to detract from the achievements of working examples often cited in India and Estonia in particular, but rather to recognize a paucity of other compelling national examples to date, especially in emerging economies.

⁴ Established by the G20 in 2014, the GI Hub has the mission of making physical infrastructure an investable asset class for private investors.

of state power can mitigate this concentration. According to this view, DPI is therefore about managing monopoly power, either through regulation or by introducing viable state-led alternatives which can foster innovation.

A third basis of concern propelling DPI inverts the fear of private sector dominance into **fear of the power of digital infrastructure if it is left only in the hands of the state** without constraint or accountability. According to this view, DPI is about transparency and balancing public and private interests appropriately around clearly enshrined and enforced rights of citizens.

A fourth set of concerns underlying DPI is **about growing societal risk**: as social and economic dependence on digital systems increases, so too their collapse or malfunction could cause widespread harm. Without strong public oversight, the reliance on private systems can generate instability with unacceptable social consequences. According to this view, DPI is about managing systemic risk appropriately.

Though they are distinct, these four concerns—which can be summarized as equity, efficiency, rights and risk respectively—are not independent of one another. Solutions to them may be mutually reinforcing, in ways typical of interventions in complex systems. But there are also tensions between them: for example, between widespread provision, which may be possible under a model of state-provision, and citizen rights if the data is misused by the state. Equally, a strong concern about systemic risk may even lead away from public provision into the apparently safer hands of tech giants whose operations are optimized for continuity and security but in the process, creates potential tensions with the goal of efficiency through competition.

A nuanced approach to DPI would recognize which concern is uppermost in each particular instance under consideration; and how to balance or mitigate resulting tradeoffs. The term already carries a weighty burden of hopes and fears, and undifferentiated usage risks it becoming a simplistic mantra with little traction in reality. So, it is time to look more closely at the ways DPI is being defined today. Since definitions are established for a purpose, the next question must be: **are the emerging definitions of DPI fit for purpose?**

Establishing the definitional space of DPI

In common with 'ESG', DPI has no official definition yet. And none is in sight: also in common with ESG, there is no body with the standing to propose anything like an authoritative definition.

The definitional space within which DPI exists is framed by its three component words. Of these:

- The first (digital) is seemingly obvious but is often tricky to pin down in practice;
- the next (public) is the most contested at this stage; and
- the third (infrastructure) is the vaguest and yet may be the most important word of the three words to clarify to avoid the DPI 'net' being cast so wide as to be meaningless.

Let us consider each in turn.

Even the seemingly obvious qualifier **'digital'** carries some definitional challenges: just how digital does something need to be for it to be considered DPI? If an infrastructure has a large physical component, such as cloud computing infrastructure with its massive server farms, or undersea internet cables with their thousands of miles of fiber, can it still be considered DPI? In many ways, this question mirrors the broader debates on defining the extent of the digital economy. Official definitions such as those proposed by the OECD for measurement purposes have distinguished between three levels of digital intensity: core (restricted to ICT goods and services), narrow (activity of producers reliant on digital inputs) and broad (significantly enhanced by digital inputs). At this stage, there appears to be little benefit from restricting DPI to the narrowest measure of digital only, but it is relevant to note the underlying gradations.

Second, the word **'public'** in this context is used in three quite different ways at present:

- as an expression of how a technology is owned or licensed i.e., owned by a public agency and/or licensed in such a way (e.g. open source) that is considered widely accessible; or
- as an indicator of the potential or actual scale of usage; or
- as a recognition that a societally desirable purpose is either intended or achieved.

These three usages are respectively based on inputs, outputs and outcomes. Each requires a different assessment to judge whether it in fact applies.

Of the three, the third—about intending a socially desirable purpose—seems at first to require the most judgment, but in fact, the other two also require some judgment. For example, associating the definition of 'public' closely with 'open source' software or 'open' data is merely to locate it on a wide spectrum of options regarding the actual nature of ownership and/or the basis of licensing of software. Just to be somewhere on that wide spectrum is likely insufficient to be considered 'public': at some point, a basis of licensing software or providing data may be deemed 'not open enough' to be considered truly public. Equally, the second usage around scale applications requires that vague word 'scale' to be clarified: is true societal scale reaching 100% of the population? Or merely 100% of the eligible users of a technology, who may be a much smaller subset? Or is it really only a simple majority of them, not 100%, or even just a 'large number' of people in a given society? Even if the threshold level of usage were clarified, ex ante, it would still require a judgment about the potential for scale unless the meaning of DPI were restricted to retrospective application. Limiting the term to actual scale achieved would be more in line with a risk-based assessment—only once it is large enough, could a DPI carry systemic risk for example. However, that usage would restrict discussion of emerging technologies which may require support to get to that level.

In their 2014 paper⁵, Emily Poole from the Reserve Bank of Australia and her co-authors from the Productivity Commission frame one potentially useful candidate definition of public in the context of physical infrastructure: “ ‘Public’ infrastructure is an investment where the government has the primary role in, and responsibility for, deciding on whether and how the infrastructure is provided in the interests of the broader community and on the source of the revenue streams to pay for the infrastructure over its life.” They point out that this definition extends beyond the narrow questions of ownership and funding to where the state has created the overarching policy and regulatory framework, which may also come with an implicit or explicit responsibility for continued service provision. Of course, this leaves questions about why and how a government would come to that decision regarding its role. This is why there remains a good case for allowing the broad understanding of socially desirable purpose with the expectation that, even if a DPI does not start with government in any role of ownership or oversight, public oversight at least will evolve with scale.

Finally, we come to the third word in the DPI cluster—**infrastructure**. Better physical infrastructure has long been considered essential for economic and even social development. But even when applied to physical infrastructure, the term is vague. Attempts to define it often end up in generalities: Ethan Zuckerman in [his 2020 blog](#) “What is Digital Public Infrastructure?” uses phrases like “things we use to build other things” or “the technology and systems necessary for society to operate”.

The tech world, used to thinking about interoperable layers of solutions, has developed a slightly sharper definition in the context of defining “infrastructure-as-a-service” as distinct from platform- or software-as-a-service. In this context, infrastructure is considered “the foundational layer of hardware and software needed to run a multitude of use cases”. The use cases are the software applications which each perform a specific function. In between infrastructure and application lies the zone of the platform, a newer but equally vague term. Platform usually refers to the incorporation of building block solutions on which different applications can be run.

Using the tech definitional schema about infrastructure requires that it always has some hardware component. Accepting this nudges us back towards accepting only the ‘core’ definition of digital mentioned earlier. However, the evolution of tech, it seems, inexorably moves towards blurring these distinctions at least in terms of providers. Large tech companies already operate at all three levels. Microsoft, for example, operates a cloud infrastructure called Azure, an operating system platform called Windows on top of which Office applications run as a service. The separate branding of Microsoft’s products makes the distinction clearer; but, as another test case, at which layer does the video conferencing service Zoom fit? It is most certainly an application, competing with other similar services like Microsoft Teams or Webex. However, Zoom is also increasingly serving as a platform for third party apps as well; and to blur the

⁵ Emily Poole, Carl Toohey and Peter Harris (2014) *Public Infrastructure: A Framework for Decision-making*, Reserve Bank of Australia bulletin available [here](#)

distinction further, the company operates its own data centers (i.e. digital hardware) hence may even qualify narrowly also as infrastructure operator albeit at a smaller scale than Microsoft. Anyway, the technical distinctions about what tech infrastructure is seem to matter less than the common understanding that infrastructure is what infrastructure does: it supports life as we know it in a way which seems important or essential: in popular discourse, many already describe Zoom as essential infrastructure for work or study.⁶

Another trend further blurring the distinctions around infrastructure is the rise of '[infratech](#)', the use of digital technology in the design, delivery and monitoring of 'hard' physical infrastructure. As the proportion of spend on the digital components of say, port construction or water delivery inevitably increases, one can imagine the not-too-distant point at which all infrastructure can be deemed digital—at least in the broad sense of the word 'digital' mentioned earlier.

Because of the difficulties in defining infrastructure clearly, another approach is to define it indicatively by listing some qualifying sub-categories. An example of this usage comes from the GI Hub. The Hub has historically focused on measuring investment in eight traditional categories of physical infrastructure: transportation, renewable and non-renewable energy generation, energy distribution, social, water, waste and telecommunications. The annex to its [annual GI Monitor](#) defines the last category, telecoms, by listing its sub categories as "investment in data centers, digital infrastructure, mobile, internet, satellite and terrestrial infrastructure." It is not clear from this list that the use of subcategories has yet added much precision to the definition.

In summary then, for each of the three words comprising DPI, there is therefore a range of definitional choices available or already in use. We may call this the 'definitional space' around the term DPI which is summarized in the table below.

⁶ See for example the typical headline usage during pandemic school closures: "How Zoom came to be essential infrastructure for millions of kids learning online" available [here](#)

Table 1: The definitional space of DPI

Word	A. Digital	B. Public: based on	C. Infrastructure
Definitional possibilities	1. Core: IT sector only	1. Ownership: public ownership and/or open-source licensing of technology	1. Narrow (tech usage): hardware <i>and</i> software used as a foundation
	2. Narrow: reliant on digital	2. Scale: reaching or likely to reach societal scale	2. Common/ broad: supporting a service considered essential or important to human life
	3. Broad: significantly enhanced by digital	3. Purpose: Having a purpose aligned with societal goals	3. Indicatively: featuring on a qualifying list
			4. Using boundary indicators: explored further below

Locating current definitions of DPI

This landscape enables us to advance our quest in this paper to consider how useful the term DPI is in practice. As pointed out in the first section, usefulness corresponds to the purpose for which the definition is developed. We can now explore the implications of this landscape by mapping in three current definitions of DPI to help test the boundaries of each against the problem which the promoter of the definition is trying to solve.

First, the **GI Hub's definition** mentioned earlier above does not explicitly mention DPI (yet) but within its category of telecoms infrastructure, it clearly includes a notion of DPI based on:

- A meaning of digital which leans towards core by prioritizing data centers, mobile and satellite communications (i.e. cell A1 above);
- A wide view of ownership (i.e. closest to B3 above) since its aim is in large part to encourage private investment into diverse ownership models for infrastructure;
- An indicative definition of infrastructure (i.e. C3) based on qualifying sub-categories some of which are conventionally used but not clearly defined.

The GI Hub's very existence is premised mainly on equity and efficiency concerns: namely, the underprovision of infrastructure as a result of constrained state finance results in the need to mobilize private resources. The GI Hub champions this solution. As a champion in a relatively

early-stage field, its definition is therefore very broad and only indicative—even surprisingly vague considering that part of GI Hub’s role is to produce credible measures of the performance of infrastructure investments over time. However, the usefulness test here is whether the fund managers and asset owners who finance infrastructure take these measures seriously or not. Without the benefit of asking investors, we may at least infer from the growing private investment reported that they do. This implies that the definition is adequate for purpose—for now, at least.

Next, a **Govstack Community of Practice** proposed a more explicit definition of DPI in a 2022 [guidance note](#): “the solutions and systems that enable the effective provision of essential society-wide functions and services in the public and private sectors.” This definition maps into the space above as follows:

- it is silent on digital (although implicitly broad i.e. A3);
- on public, it adopts the society-wide measure (B2) while taking pains to opt out of limiting ownership considerations (i.e. not B1) by referencing both public and private sectors; and
- adopts an implicitly common/broad view (C2) of infrastructure solutions and systems, with modifiers based on functionality (enabling essential society-wide functions); and performance (“effectively”).

This definition is strongly rooted in equity concerns with an efficiency undertone: Govstack after all aims to help governments build more human-centered sustainable digital infrastructure. Govstack’s role is to champion this approach. Hence its definition too is broad, focusing on essential society wide and effective provision. Note that general advocacy does not demand high degrees of definitional precision; in fact, it even may benefit from some deliberate vagueness to allow space for a nascent field to evolve.

Most recently, **specialized DPI enabler Co-Develop** has put out [its own answer](#) to the question of what is DPI. Its definition is: “society-wide digital capabilities that are essential to participation in society and markets as a citizen, entrepreneur and consumer in the digital era.” This definition implicitly reflects a broad view of digital (i.e. A3 above); like Govstack, a society-wide measure for public (B2); and a view of infrastructure as essential capabilities (also C2 like Govstack). However, Co-Develop has also published a [thoughtful reflection](#) on how the definition links to or differs from others, and what its purpose is—“to contribute to an ongoing discussion” and to guide its own engagement with partners as it supports DPI deployment globally. Co-Develop explicitly recognizes that the definition will (and should) evolve.

Some DPI definitions simply list the so-called ‘big three’ sectors deemed to qualify as DPI: namely, payments, identity and data exchange, somewhat akin to the GI Hub approach to defining infrastructure. *Indicative definitions* like this do not restrict DPI to these sectors alone, but they create the inference that, for other sectors to be added, they would need to demonstrate strong similarities to these three prime sub-sectors.

To see whether this approach can bring greater clarity, let us consider one of those sub-sectors further—namely, payments which is arguably the oldest and most established as a knowledge domain. The Committee on Payments and Market Infrastructures (CPMI) at the Bank for International Settlements publishes the *Principles for Financial Market Infrastructures* (PFMI). These are the international standards defining the oversight of systemically important payment and settlement systems, so they require a degree of clarity and precision. The PFMI defines a financial market infrastructure as “a multilateral system among participating institutions, including the operator of the system, used for the purposes of clearing, settling, or recording payments, securities, derivatives, or other financial transactions.” PFMI goes on to add some distinguishing hallmarks: “FMIs typically establish a set of common rules and procedures for all participants, a technical infrastructure, and a specialized risk-management framework appropriate to the risks they incur.” Its reference to ‘technical infrastructure’, usually meaning the technology to switch transactions among parties involving both hardware and software, recognizes that there is a blend of hard and soft infrastructure. Stripping out the terms specific to the financial sector (such as clearing and settling) to consider the core, the PFMI definition introduces the criteria that infrastructures of this sort are necessarily multilateral systems involving multiple participants and an operator.

The CPMI as the owner of this definition is most concerned about systemic risk, although it also references efficiency concerns and more recently, also concerns about equity through financial inclusion. As a result of its prime emphasis on risk, CPMI overlays its base definition with thresholds at which an FMI can be considered systemically important, triggering more intensive regulatory oversight. Unlike the broad championing definitions above, this definition carries immediate and real consequences: PFMI principles are widely implemented through local regulations and result in increased costs for both infrastructure operators and overseers to ensure that the systemic risks are well managed.

PFMI is an interesting example of achieving sufficient definitional clarity to have force, supported by an evolving body of principles which outline how to implement this in practice.⁷ However, even though this regulatory purpose is the most consequential of these definitional examples, we should acknowledge that technological change in payments has blurred some of the boundaries—hence the hallmarks which are pointers used to supplement the core definition.

An emergent approach to defining DPI

An emergent approach to defining DPI recognizes that there are different purposes behind different definitions. However, a plethora of conflicting definitions can cause confusion hence the need to at least define boundaries within which particular definitions may take shape. An emergent approach also recognizes that at an early stage of development, the presumption should be in favor of wider definitional space unless there is good reason to restrict it—which

⁷ The latest (2012) version of PFMI is contained in a 188-page document.

would argue for accepting the widest definitions as the ‘breeding ground’ within which to test specific definitions for their usefulness and feasibility. Over time, more precise definitions are likely to emerge linked to the creation of boundary conditions i.e. at least ruling out certain factors.

In this section, I demonstrate what that emergent boundary testing could look like by applying the two criteria in the PFMI definition of infrastructure. These are:

- *Is it multilateral* i.e. can it be used equally by multiple participants? If not, it is likely to be a service or application. For example, **Kenya’s M-Pesa** mobile payment solution is very widely used, and may be considered essential for small business, but it is regarded as a payment service, not as a payment system and therefore an infrastructure. This is because it is not truly multilateral, even though it involves other parties like banks as service providers. On the other hand, **Kenya’s Pesalink** instant payment solution, which is much less widely used than M-Pesa, is considered a payment system because of the multilateral participation of member entities which today are mainly banks.
- *Is there an operator responsible for making part or all of the solution function in a specific instance?* If not, it may simply be a technology or a set of code or data. This is a very wide category easily confused with software development. However, this raises some difficult boundary cases around decentralized technologies. Consider two which are widely regarded as infrastructure: the **internet and bitcoin**.⁸ Both are based on digital protocols and algorithms which function without a single centralized operator. However, in their polycentric nature, they may have operators in defined areas required for their functionality: for example, ICANN maintains domain name registry for the internet and is clearly an operator in that sense at least. There is no similar registry body for bitcoin: the Bitcoin Foundation is more self-professed advocate than operator.

The world of current payment systems allows us to consider further the implications of these candidate DPI boundary lines using the lens of an open-source payment solution called **Mojaloop**. Mojaloop has been recognized as a digital public good (DPG) by the Digital Public Goods Alliance.⁹ Developers using Mojaloop describe it as “the first open-source platform for interoperability in a real-time payment network.”¹⁰ Mojaloop itself is backed by a Foundation which oversees the development of the open code base and promotes its usage. Mojaloop is clearly a DPG but can it also be considered a DPI? To deem Mojaloop a DPI would mean also considering any widely used payment software solution (of which there are a number) as DPI. However, TIPS, Tanzania’s **new instant payment scheme** using Mojaloop software, has an operator, and as such may qualify as DPI. But equally the operator of an instant payment scheme using a different software approach could also qualify, provided it met the tests of public purpose.

⁸ Bitcoin is named among the few ‘L1 blockchains’ which served as a foundation for a variety of ‘L2’ blockchain-related applications.

⁹ See [here](#)

¹⁰ See [here](#)

Finally, widening the lens from payments to the banking sector as a whole: **Open Banking** is the process by which financial institutions either voluntarily or involuntarily expose APIs allowing their clients to authorize third parties to access and make use of the clients' data. Open Banking clearly involves digital technology (the use of APIs) and it is starting to achieve widespread usage in some places; but is it a type of DPI? Applying the tests of multilateralism and having an operator, the answer would be yes *only if* there were an operator responsible for a multilateral system of APIs. This is not generally the case but it is in the UK. There, the **Open Banking Implementation Entity** (OBIE) is a not-for-profit company established by British banks to operate an open banking regime inter alia through establishing standards and maintaining a directory of participants. By these tests, OBIE is an infrastructure which may qualify as a DPI, whereas Open Banking in general form is not.

The point of this discussion is to indicate how employing certain boundary tests i.e. the approach labeled as C4 in the definitional space) can inform making sharper distinctions between what is and is not DPI like those summarized in Table 2 below.

Table 2: Parsing the infrastructural Pairs using the PFMI criteria

Is DPI:	Pesalink (Kenya)	OBIE (UK)	TIPS (Tanzania)
Is not DPI:	M-Pesa	Open banking APIs	Mojaloop

The discussion so far suggests that there may be more value for now in seeking clarity around the “I” in DPI , while leaving the other two terms, digital and public, as broad as possible since little is to be gained now by restricting them.

What’s similar across different types of DPI?

Let us now adopt the broad definitional boundary approach advocated so far as the basis of sufficient clarity to address the second main question of this paper, **how useful is the term DPI?** This is another way of asking in popular parlance of “whether the juice (of having more and better DPI) is worth the (definitional) squeeze.” The question of usefulness could also be framed the other way round—**what, if anything, would we lose at this stage by abandoning the use of the term DPI?**

To address either of these questions, we postulate two indicators of usefulness and consider each in turn for DPI:

- The term groups items which have essential similarities without masking even greater differences;

- The term mobilizes and directs attention towards important questions and issues, more than it distracts from them.

For this discussion only, let us restrict our lens initially to the indicative ‘big three’ current categories of DPI—payments, digital ID and data exchange. After all, if DPI cannot add value as a lens across these highlighted three, then it is unlikely to do so across even more disparate instances. At first glance, even these seem quite distinct. While payments has the most developed and discrete knowledge domain, but the other two also have their own evolving domains and language. They are often conceived of as separate, though related, layers of a national technology ‘stack’.

However, the obvious similarity is that all three enable the safe and secure exchange of digital data between and among multiple parties, though in different forms. In the case of payment systems, the data is linked to a transfer of recognized digital value, whereas in the instance of open banking (a form of data exchange), the data is personal information which can be used to create value in the form of more and better tailored offers of financial services. Digital identity attaches ownership characteristics to the data with varying degrees of assurance. Seen this way, all DPI is really a means of data exchange.

Let us look deeper into some large-scale instances of the three main types of DPI. To create concrete examples as focal points, consider Mastercard Worldwide as an operator in the card payment space, India’s UIDAI in digital ID and UK’s OBIE, which we encountered earlier, in data exchange. All three operators have had to create, or be part of creating, new standards—some open, some not—in order to regulate the ecosystems in which data can flow reliably. And this observation leads to a further similarity: all have also had to persuade end users to trust and rely on their services without compulsion.¹¹

These observations point to the reality that **all these instances are in fact applied examples of trust frameworks**. Trust frameworks are “a common set of best practice standards-based rules that ensure minimum requirements are met for security, privacy, identification management and interoperability through accreditation and governance.”¹² These examples illustrate how trust frameworks can operate with different requirements and at different scales—sectoral (e.g. OBIE in the British banking sector), nation-wide (e.g. UIDAI in India as a whole) and international (e.g. Mastercard across many jurisdictions).

If DPIs are conceived as instances of **operating societally important trust frameworks**, then they may have more in common than not across the sectoral categories. This is true especially if their trustworthiness is interdependent on other frameworks or layers, as implied in the use of

¹¹ UIDAI started a ‘pull’ solution which relied on incentives to use rather than compulsion; even if it can be required for authentication for public schemes, private reliance on its authentication still cannot be required.

¹² This definition is sourced here: [MATTR](#)

the 'stack' metaphor of interoperable DPIs. If they are indeed socially important, then one may assume that there would be a societal interest in their reliable, safe functioning, just as there is in physical infrastructure. However, it is striking at present how uneven the degree of oversight across these areas is: in most places, specific trust frameworks are regulated only:

- (i) if they deal in recognized value (i.e. they are deemed to be payment systems under legal regimes common in most countries); and/or
- (ii) if they exchange personal data (i.e. falling under privacy and protection laws which are increasingly common).

The **nature of oversight is also fragmented at present**: the central bank typically oversees only those trust frameworks which carry value; while a data commissioner is charged with oversight of privacy considerations, each bringing a quite different mindset and approach to the issue. And if the network effect created by a trust framework becomes large enough to have anti-competitive effects, then the competition regulator may also be summoned. This fragmentation among regulators risks missing the essential commonalities that trust frameworks create networks with important externalities; and also that some may become so widespread that their failure would cause significant distress.

What important new questions are raised by using the term DPI which are not already raised or considered within the sub-categories?

Articulating new questions as the result of using a term is an important test of its usefulness. Here, as one example, consider this thought experiment: are the similarities across DPIs such that they may be better overseen in future by one regulator which operates more like utility regulators do in the realm of physical infrastructure such as electricity or telecoms? In only a few places so far has payment system regulation already moved towards recognizing the importance of the utility dimension. For example, the UK government established a Payment Systems Regulator in 2015 modeled on other sectoral utility regulators. Its mandate is to consider the systemic efficiencies and risks of the payment system, leaving the supervision of specific prudential risks of payment providers to financial authorities. This oversight approach has enabled a focus on initiatives which build the network, paying attention to issues of consumer trust, effective competition, and network efficiency in ways which previous approaches did not.

While regulation remains fragmented, the convergence of operators across the layers of the stack is already underway. For example, tech giants like Mastercard have leveraged their core capabilities in global payments interoperability (remember, this is just a special form of data exchange) to add [open banking solutions](#) through a company acquired in 2020; as well as launching a [Digital ID service](#) which is presently being trialed in selected markets like Australia. As an operator of large-scale digital infrastructure, Mastercard clearly anticipates synergies across the layers and sees the value in leveraging its trusted customer payment brand into these adjacent spaces. Mastercard is by no means alone: among others, the Alibaba Group

(through Ant) also already plays at scale in all three layers in its home market China. Other tech giants may follow. How are operators like Mastercard or Alibaba to be overseen in future if their solutions in the other layers grow to become as important as their payment solutions?

That question—how best to manage oversight if tech giants come to dominate the operation of additional layers of DPI? -- is an example of a question which seems better addressed using the wide-angle lens of DPI, rather than the narrow current sectoral lenses which may obscure the larger picture.

Answering this question of overseeing dominant tech giants will raise questions of cross-border collaboration just as the oversight of a global systemic payment infrastructure operator like SWIFT has done in the payment sector. The costs of ‘domination’ through lock in can be reduced by an approach to setting consistent international standards. The move towards open standards in areas like digital ID seems like a positive way of increasing competition in delivery and operation among private providers, even allowing specialization within the value chain.

As a further example, in a [February 2023](#) address, the General Manager of the Bank for International Settlements, Agustin Carstens, made the case that “to reap the greatest benefits of innovation in money and payments, we must think big.” As an illustration, he posited the need to create a unified ledger as “a digital infrastructure with the potential to combine the monetary system with other registries of real and financial claims. It would need to be a public-private partnership with a clear division of roles, and where the central bank is tasked with underpinning the trust in money.” This seems like a clear case, made from an efficiency perspective, where the wide angled lens of DPI is more valuable than a sectoral payment lens. And it will require public-private collaboration, something he points out is already at the heart of the global monetary system.

What do we need to know about DPI to make it more useful?

The argument so far has been both that DPI can be defined sufficiently clearly and that it has potential value. However, there is much that still needs to be understood to extract and apply that value in diverse applications.

Here is a preliminary list of further questions arising from the analysis above:

1. How to measure the effectiveness of DPI? Vora and Dolan make a start on this project in their 2022 Brookings paper available [here](#) entitled “What is good digital infrastructure?”
2. What are other examples of trust frameworks which may qualify as DPI because of their scale and purpose?
3. How is the usage of the term DPI evolving in popular usage? (i.e. when does its usage break out of narrow communities such as international development practitioners to be used by regulators or policy makers? And for what purpose)

4. What are the common elements of the knowledge base across the three main DPI subsectors? Could there be common base qualifications for operators which allow for specialization in one area to be built on top?
5. Are there scenarios under which an international standard setter (like CPMI for payments) might evolve for DPI? What might it look like?
6. What are the important aspects of utility regulation which carry over to digital infrastructure?

Conclusion

Though nascent, usage of the term DPI is already growing fast. This paper has argued that, **at this early stage, broad definitions may be most helpful**, but that to be useful, any definition must have sufficient clarity to distinguish DPIs from the large class of technology solutions in general. In general, an emergent approach to definition is useful, which seeks greater clarity over time mainly by exploring boundary conditions and ruling out spaces which do not correspond to the purpose for which the definition is created. In this paper, I have explored examples of getting to greater precision through using boundary conditions about what constitutes infrastructure.

Undergirded by an appropriate emergent definition, **DPI has potential value as a cross-cutting lens**. Envisioning the sectoral layers together as DPI may enable policy makers to make better assessments of the implications of convergence already taking place across different layers of payments, identity and data exchange. It may also equip policy makers to see more clearly what issues are at stake, so that they can apply scarce resources to the binding constraints and/or sensitive points of DPI solutions, rather than taking a uniform approach to building DPI in advance of evidence of what works best. For all these reasons, rather than rejecting the use of the umbrella term DPI in favor of remaining with the underlying sub-sectors, it seems more promising to take the longer, harder path of shaping its usage over time to become more precise and more useful.

Almost twenty years after it was first coined, that other three letter acronym ESG remains undefined: there are still no official internationally accepted definitions, though international standards in some areas and national laws are now taking effect in Europe, the US and elsewhere. Yet despite the absence of widespread official definitions, investors and activists have championed the term to the point where it has entered wider usage in public discourse. Some of its vagueness has also been its strength, up until now anyway: it was simple enough to remember and clear enough to capture the zeitgeist of late capitalism in the face of mounting global challenges to its legitimacy. Yet it was also flexible enough to be molded to accommodate a range of national circumstances.

DPI today is perhaps in the position that ESG was circa 2007, three years after first usage. It seems possible, even likely, that DPI could over the next twenty years walk a similar road

towards widespread usage. However, whether the usage of the term will be accompanied by outcomes which address the underlying hopes and fears which have given it birth, will depend on whether an emergent path of openness with increasing certainty can be defined and followed for DPI.