



TOWARDS PUBLIC DIGITAL INFRASTRUCTURE: A PROPOSED GOVERNANCE MODEL

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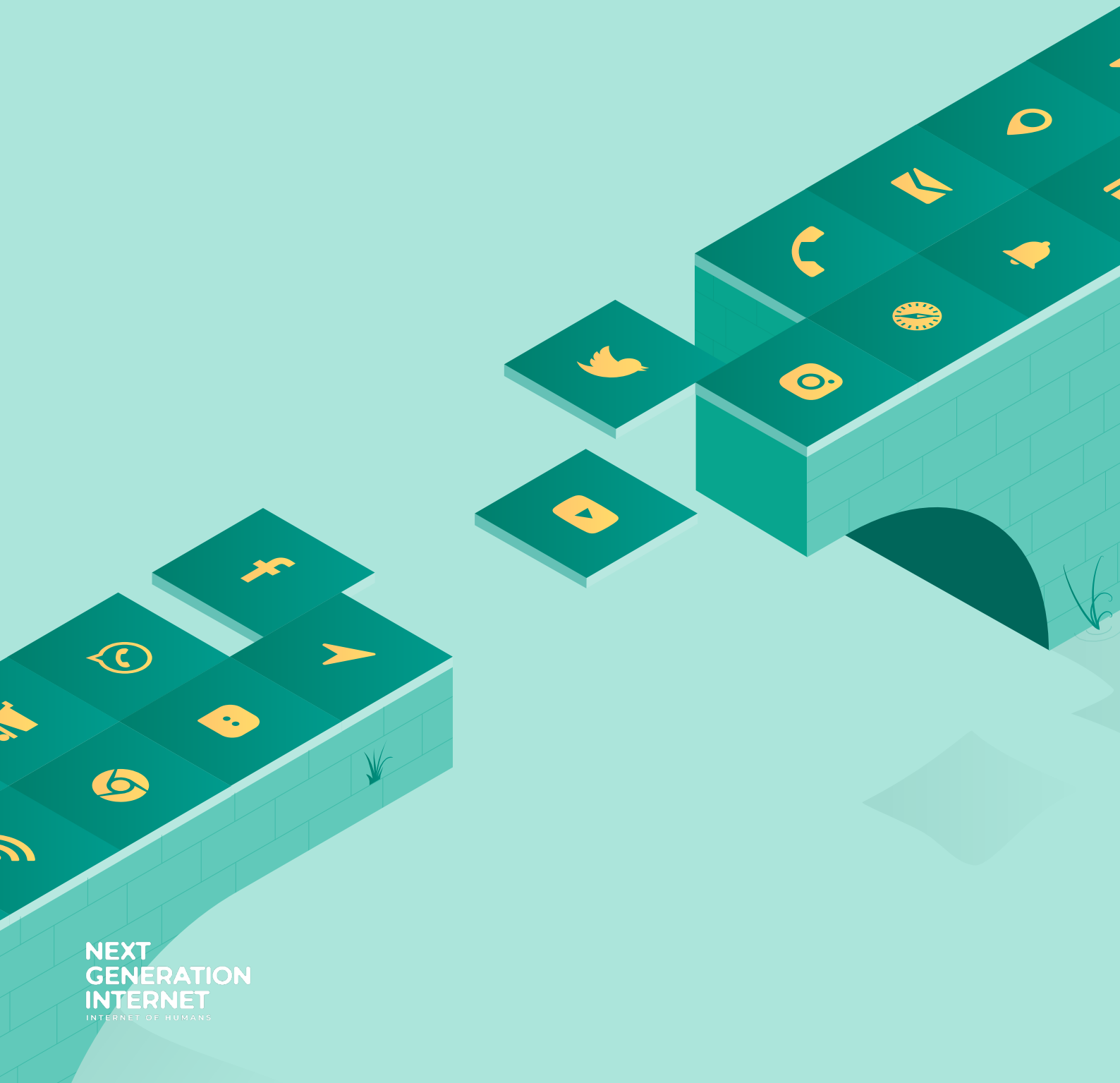


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EXECUTIVE SUMMARY

On today's internet, power is concentrated in the hands of a handful of actors who increasingly control what we read and what we see.¹ We live in a winner-takes-all digital economy, where the tendency tends to be towards ever more concentration, both within and across layers of the technology stack.² The battle for domination is increasingly also a geopolitical one, with the internet a central playball in the current tide of resurgent Great Power conflict. Attempts by both governments and large technology companies to take back control are an important source of internet fragmentation – recent events have us teetering closer to the splinternet than ever before³ – and leave citizens with little agency and choice.

Many around the world have looked to Europe to provide an alternative vision to these top-down approaches, and the rather reductive Beijing versus Silicon Valley binary that increasingly drives it. But if the EU wants to shape a real alternative it needs to change its approach. Europe's role as a regulatory superpower has been much-praised, but it has also increasingly become clear that harnessing the so-called Brussels Effect,⁴ the EU's ability to influence global norms and regulation, remains limited to softening the hardest edges of the existing digital economy, but has little generative potential on its own. Europe cannot just remain the global referee, but also needs to create alternatives of its own by becoming a market-shaper, rather than remaining a market-taker. The Commission's current open strategic autonomy efforts and NextGenerationEU funds reflect this ambition, as does the development of a bold set of new legislation, notably the DSA,⁵ DMA⁶ and DGA,⁷ which are set to write the rules for the digital economy for decades to come.

These ambitious initiatives need to be put at the service of setting out a compelling and tangible vision for a more resilient and open future internet. Europe now has the momentum and opportunity to take the lead in imagining new institutions that can deal with the unique challenges digitisation has brought to the fore. Now is the moment to become more deliberate about using the levers of government strategically

to generate sustainable, interoperable ecosystems in which alternative solutions can thrive.

As the European Commission seeks to give shape and meaning to its objective of achieving open strategic autonomy,⁸ and articulate a compelling alternative vision in an increasingly (geo)politicised global technology arena, it needs to ensure it promotes an internet model that is based on openness and diversity, and champions the public good, and encourages like-minded peers around the world to join these efforts. This paper aims to set out a new framework to do just this; a new model that would seek to redistribute power over the internet by building a more vibrant, diverse and resilient ecosystem of trustworthy open solutions on top of shared set of rules and open protocols and standards. We will refer to this model as **Public Digital Infrastructure (PDI)**.

We already have the technical and governance building blocks at our disposal to make this Public Digital Infrastructure model a reality. We also have the political momentum on our side through a number of ambitious policy proposals and funding agendas on the European level. The challenge now is to integrate these building blocks into a single cohesive system, and to ensure we put into place the right institutions and rules to ensure the DPI can achieve trust, scale and openness. This approach is made up of three key pillars:

1. Generating an ecosystem of healthy, interoperable alternatives:

Public Digital Infrastructure could help us move away from a platform economy, where one actor owns a whole suite of tools and can unilaterally set the rules, towards a protocol-based economy, in which we could see a collaborative ecosystem of smaller, interoperable solutions and applications emerge, built on top of a shared set of rules and open protocols. We could see this as an alternative, parallel infrastructure, made up of open, trustworthy solutions and public goods. Through **collaborative interoperability**, solutions built on top of the Public Digital Infrastructure would

1 Bego, K. (2020). *A Vision for the Future Internet - A Roadmap*.

2 Ibid.

3 <https://www.nesta.org.uk/feature/10-predictions-2017/the-splinternet/>; <https://www.technologyreview.com/2022/03/17/1047352/russia-splinternet-risk/>

4 Bradford, A. (2012). *The Brussels Effect*. Northwestern University Law Review, Vol. 107, No. 1, 2012, Columbia Law and Economics Working Paper No. 533, Available at SSRN: <https://ssrn.com/abstract=2770634>

5 <https://digital-strategy.ec.europa.eu/en/policies/digital-services-act-package>

6 <https://www.europarl.europa.eu/news/en/press-room/20220315IPR25504/deal-on-digital-markets-act-ensuring-fair-competition-and-more-choice-for-users>

7 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0767>

8 https://trade.ec.europa.eu/doclib/docs/2021/february/tradoc_159434.pdf

proactively set out to integrate their solutions with other tools built on the framework.

To help this ecosystem thrive, the Commission and other governing bodies (from the local level to the supra-national) would seek to leverage their own market shaping-levers, for example through strengthening rule-setting through procurement, and moving their own solutions on top of the system. The European Commission would further provide the funds for an independent **Public Technology Fund**, which would support the development of applications on top of the Public Digital Infrastructure, as well as fund public goods to support the wider ecosystem.

2. Designing governance models fit for purpose:

No single centralised entity – public or private – would control the underlying Public Digital Infrastructure model; instead, the system would be governed on the basis of a shared set of rules and protocols for, for example, interoperability, data sharing and online identity management. In this model, civil society, trusted public institutions, academia, and the public-interest technology community would be empowered to collaboratively shape the rules, standards and governance models underpinning this shared logic.

To ensure these decision-making processes remain open and representative, but also geared towards effective decision-making, the European Commission would provide the funding for the establishment of a fully independent **Public Digital Infrastructure Agency**, tasked with bringing together the community, and providing resources for maintenance and auditing of the PDI's components.

3. Opening up data and identity:

Every internet user would be provided with the means to control their own digital identity and personal data online, empowering them to share what they want, with whomever they want, on their own terms. To do this, each user of the Public Digital Infrastructure model would have the right to be issued their **own portable online identity and personal data wallet**, which would allow them to share and pool data on a case by case, consent-based basis.

Developers of applications and services would be able to tap into the user-generated data commons that would result from this pooling in a way that is accountable and fair, rather than feel compelled to amass their own proprietary data lakes in order to compete. We should not imagine these commons as

one single enormous, distributed data lake, but rather as a set of data governance mechanisms, ranging from data commons to trusts, which would be employed and governed depending on the use case and sensitivity and utility of the data at hand. Users would be able to pick and choose which commons to participate in, and solutions would contribute to these commons as a condition of being part of the PDI.

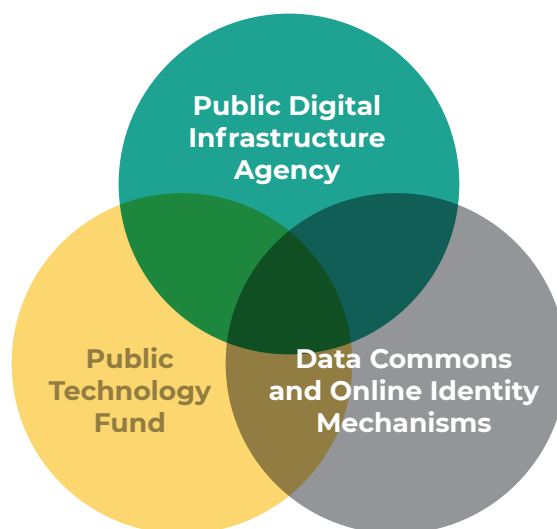


Figure 1: Three ingredients of the Public Digital Infrastructure framework

By redistributing power over technology, rather than seizing it, Europe can empower internet users around the world to benefit from and participate in the digital economy on their own terms, while also championing its own, alternative vision – a vision built on ideas of openness and pluralism – to compete with the reductive Shenzhen versus Silicon Valley dichotomy. Because rather than trying to build the next Google or WeChat, should we not focus on building the infrastructures that prevent the next Google and WeChat instead?

1. INTRODUCTION

On today's internet, power is concentrated in the hands of a handful of actors who increasingly control what we read and what we see.⁹ We live in a winner-takes-all digital economy, where the tendency tends to be towards ever more concentration, both within and across layers of the technology stack.¹⁰ And centralisation begets centralisation. Those with access to most data and users, the best lawyers and lobbyists, are best-placed to grow even larger, and so also seize the next wave of innovation, thus perpetuating their own position. The tech giants are no longer content with just ruling on the application level of the internet either. In pursuit of vertical integration, the platform incumbents increasingly also own elements of the internet's underlying physical infrastructures¹¹ and dominate opaque but vital standard-setting processes.¹² The business models underpinning the digital economy reward this kind of concentration and consolidation – with the most powerful actors now acting as essential infrastructures in their own right.¹³

The large platforms are able to play a dual role, where they govern and control key infrastructures, while simultaneously also competing for their use. This ability to unilaterally set the rules of the game within their own platformed walled gardens, both in relation to the user, as well as vis à vis the businesses and initiatives that rely on the digital infrastructures these platforms provide,¹⁴ has grown more pernicious as the diversity of alternatives has dwindled. Other solutions across the stack, especially those that do not want to compete in the data-hoarding race to the bottom, find themselves facing an increasingly uneven playing field. This is a particular source of concern for European policymakers, as Europe continues to punch below its weight in the digital economy. Current conditions make it difficult to remedy this without bold, systemic change.

It is not just direct competitors that suffer from this extreme monopolisation. As ever more aspects of our economies and societies are becoming intertwined with and mediated through digital platforms, sectors as wide-ranging as media and journalism to brick-and-mortar retail find themselves increasingly at the mercy of black box algorithms and governance-by-terms-and-conditions. Concentration of power in

the digital economy harms Europe's economies, the vibrancy of our democracies and civic institutions, and encroaches on citizens' personal autonomy and privacy. Relying on a handful of highly-centralised actors also introduces risky single-points-of-failure and threatens the resilience of the internet, as the Facebook outages of September 2021 have made all too clear.¹⁵ The impact of the current war in Ukraine on Russia's internet further shows how easily overreliance on a small number of digital solutions can be weaponised, both by repressive governments and those that sanction them.¹⁶

Ultimately, we are left with a less dynamic internet, an internet solely defined by the laws of the market and the narrow futures conceived by those that wield most power over it. What kind of internet could we imagine if more choices remained open, if we could optimise for something other than clicks and profit?

While we see a growing concern among global policymakers - from the US to Europe - and the general public about the impact this asymmetry of power has not just on the internet, but on our societies, political systems and collective security more generally, current regulatory approaches have not been able to effect sufficient change yet. This is in part because of the supra-jurisdictional power and outsized lobbying influence the companies in question enjoy. But an equally significant issue is that efforts to regulate Big Tech tend to focus on addressing the worst excesses of the system ex post, rather than on preventing problems from the outset. We lack a cohesive vision for what an alternative could look like, which leaves us tweaking at the margins of a broken system.

If we want to solve the many problems we face on the internet today, policy approaches need to move beyond looking at the most visible and stark manifestations of the issue, and instead focus on addressing the root causes: the concentration of data in an ever smaller number of siloes, the winner-takes-all dynamics across all layers of the technology stack, and anti-competitive business models that intrinsically reward scale. It is not impossible to address these dynamics, to break through the cycle. But it will take

⁹ Bego, K. (2020). *A Vision for the Future Internet - A Roadmap*.

¹⁰ *Ibid.*

¹¹ Aldrich, R.J. and Karatzogianni, A. (2020) Postdigital war beneath the sea? *The Stack's underwater cable insecurity*. *Digital War*, 1, pp. 29-35. doi:10.1057/s42984-020-00014-x

¹² Ten Oever, N. (2020). *Wired norms: Inscription, resistance, and subversion in the governance of the Internet infrastructure*

¹³ Pasquale, F. (2018). *From Territorial to Functional Sovereignty: The Case of Amazon*. *Open Democracy*.

¹⁴ E.g. the reliance of media companies on Google Ads, e-commerce businesses on Amazon's storefront, independent application developers on the App Store.

¹⁵ https://en.wikipedia.org/wiki/2021_Facebook_outage

¹⁶ <https://www.washingtonpost.com/technology/2022/03/04/russia-ukraine-internet-cogent-cutoff/>

more than throwing buckets of water out of an already sinking ship – it requires fixing the ship, to radically reimagine the institutions and economic models that govern the internet itself.

This paper argues that we have the building blocks at our disposal that could enable policymakers to do just this. We also currently have significant momentum to shape the next decade(s) of development through a number of ambitious But it requires governments to more effectively use the levers already at their disposal, and put these levers at the service of transforming Europe from a market taker into a market shaper, and creating market and non-market public goods.

European governments can create the underlying conditions for fairer alternatives to emerge, through creating momentum around a shared set of rules. This can be done through, for example, using standard-setting and public procurement strategically (operationalising a “code is law” approach),¹⁷ opening up monopolies through strengthening interoperability and data portability, and supporting the adoption of open technology. Governments can further help these same new alternatives to grow and thrive, by using their own purchasing power to help spur demand for these tools, and through building broad-based coalitions of trusted actors to adopt and champion new approaches. Combined, these ideas and mechanisms could help build an internet model that is based on openness and plurality: a diverse ecosystem of smaller solutions, grown on top of a shared set of principles and building blocks. We will refer to this idea as Public Digital Infrastructure (PDI) throughout this paper.

¹⁷ Lessig, L. (2000) *Code is Law*, Harvard Magazine.

1.2. THE STRUCTURE OF THIS PAPER

This paper is not the first to call for the development of public digital infrastructure. As a concept, the idea is gaining momentum in civil society, academia and the wider policy community in Europe, the United States, and beyond.¹⁸ What we miss, however, is agreement and shared language on what public digital infrastructure means in practice, as well as a common understanding of what kind of building blocks should underpin such a new logic. Which interventions would we need across the layers of the stack? What governance models and coalitions could help bring robustness, trust and scale to the underlying structures? How can these ideas link up with existing policy agendas? This paper by no means claims to resolve these open governance and design questions definitively, but does hope to further the current debate by setting out a concrete proposal for what a digital public infrastructure framework could look like, and what kind of new institutions we should establish to help shape and maintain it.

The proposals in this paper build on the author's own earlier writing on the need for public digital infrastructure and bolder thinking on the role governments can play in building a more resilient and democratic future internet. This contribution attempts

to bring together these various elements into a single cohesive system that could help facilitate the transition from a platform-based digital economy, to a protocol-based one.¹⁹

This paper consists of three parts. In this first introduction, we have discussed the nature of the complex challenges we face on the internet today, with a particular focus on the root causes of the concentration of power across the layers of the internet stack. The second part argues that Europe's current approach to addressing this issue – mostly through harnessing its regulatory superpower and, more recently, a focus on achieving open strategic autonomy – risks falling short. More imaginative, ambitious institutional innovation is needed. Public digital infrastructure could be exactly that kind of solution. The final, and core, section of the paper delves deeper into the concept of PDI itself, and proposes a model for how it could be put into practice – primarily through the establishment of an independent **Public Digital Infrastructure Agency**, concerned with governance and coalition-building, and a **Public Technology Fund**, empowered to fund solutions and public goods on top of the PDI model.

Public Digital Infrastructure Agency

Independent governance body in charge of development and maintenance of underlying open protocols and infrastructures.

Public Technology Fund

Independent fund to support new solutions and public goods built on top of the public digital infrastructure.

Figure 2: Two new institutions

¹⁸ Other noteworthy initiatives in this space include Ethan Zuckerman's [Initiative for Digital Public Infrastructure](#), the [SDEPS Coalition](#) (NB: the author is a member), [Shared Digital Europe](#), Waag Society's [Public Stack](#) and the [PublicSpaces](#) initiative.

¹⁹ The NGI Forward Project and Nesta have often made the case for public digital infrastructure, for example in our reflections on the emergence of the splinternet (Katja Bego, [End of the Web](#), 2017), through Sir Geoff Mulgan's work on [data commons](#) (2019), Katja Bego's [Roadmap for the Future Internet](#) (2020), and book chapters (2021) and long reads (2021) on public digital infrastructure as a sovereignty strategy.

2. EUROPE'S MOMENT OF OPPORTUNITY

Many around the world have looked to Europe to provide us with an alternative vision to the rather reductive Shenzhen versus Silicon Valley binary. But if the EU wants to shape a real alternative we need to change our approach. The European Commission should seek to move away from a government response that predominantly deals with treating the symptoms of a fundamentally broken system, and become much bolder and imaginative about designing solutions that prevent the self-perpetuating cycle at the root of the current digital economy from the outset. This means imagining new institutions that can deal with the unique challenges digitisation has brought to the fore. It also means becoming more deliberate about using the levers of government strategically to generate sustainable ecosystems around new solutions. This means rethinking the regulatory toolbox, but also strategically harnessing governments' purchasing power to create markets and momentum for new frameworks and tools. Only through generating the conditions for alternatives to thrive and changing the rules of the game, can we challenge entrenched monopoly power.

In recent years, Europe has been able to flex its muscle as a regulatory superpower, harnessing the so-called Brussels Effect²⁰ to not just set high standards within the EU, but to also export these principles further afield. The global proliferation of data protection regulation modelled after the GDPR shows what this can look like in practice. But while these interventions have gone some way in addressing the broken and exploitative business models the internet giants rely on, we must also acknowledge they have not yet led to the emergence of the more value-led and human-centric alternatives many had hoped for.

There is growing recognition among policymakers that if the European Union wants to take the lead in shaping a better future internet, focus should also be on building our own digital technologies and solutions – not just soften the edges of those solutions already there. Playing the referee is not enough if we want to see European values embedded in the technologies we increasingly rely on. The European Commission's

recent push for “open strategic autonomy”, which aims to wean Europe off of its risky dependency on increasingly volatile access to resources, fragile supply chains, and geopolitically-charged competition over innovation, is the leitmotif through which many of these debates and efforts are now taking place.²¹ The outbreak of Russia's war against Ukraine has only added extra urgency, and hopefully also momentum, to efforts to strengthen Europe's geopolitical position in the world (and on the internet).

But caution is necessary. Digital sovereignty is a muddled term that means very different things to different people. Under this banner of strategic autonomy, we already notice a growing push to create our own national champions. Joining the R&D bandwagon to build European tech giants or illusive unicorns to compete with Shenzhen and Silicon Valley will however not solve the underlying challenges at the heart of the current internet economy. These new European superstars would still be forced to operate under the current rules of the game, rely on the same exploitative business models, and would thus risk only perpetuating existing problems and resilience challenges. Developing a technology or application in Europe does not necessarily mean it is developed in line with European values; tacking a “Made in the EU” sticker on a solution is not enough.

Europe should move away from pursuing this 'domestic superstars' strategy to an approach focused on creating a more vibrant and diverse ecosystem of open digital applications, technologies and infrastructures. A number of upcoming policy priorities and agendas offer a unique moment of opportunity to do just this. The European Commission has committed to dedicate twenty percent of the Next Generation EU recovery funds towards facilitating the digital and green transition;²² its new Digital Compass²³ translates these aspirations into a number of tangible targets across the technology stack. The recently-announced Global Gateway programme²⁴ is a vehicle through which Europe can support the development of digital infrastructure not just in Europe, but also beyond. These initiatives should be

²⁰ Bradford, A. (2012). *The Brussels Effect*. *Northwestern University Law Review*, Vol. 107, No. 1, 2012, Columbia Law and Economics Working Paper No. 533, Available at SSRN: <https://ssrn.com/abstract=2770634>

²¹ https://ec.europa.eu/commission/presscorner/detail/en/AC_20_889

²² https://europa.eu/next-generation-eu/index_en

²³ https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

²⁴ https://ec.europa.eu/commission/presscorner/detail/en/ip_21_6433

combined into a clear, comprehensive vision and harnessed to champion openness and strengthen the values underpinning the Digital Public Infrastructure model. All of these ambitious initiatives would benefit from a more cohesive vision for what an alternative model for the internet could look like, and how openness and distribution of power can be harnessed as a strength, rather than a weakness.

These sovereignty efforts move in tandem with several ambitious ongoing policy proposals, such as the Data Governance Act, which aims to open up access to data in a responsible way, the AI Act, which seeks to strengthen the development of ethical AI in Europe, and the Digital Markets Act, which seeks to address monopoly power in the digital economy. Also these key policy dossiers, which are set to shape Brussels' legislative approach for at least the next decade, can be leveraged strategically to focus on creating markets for alternatives. The Data Governance Act, for example, offers space to create data commons around personal data – which could help smaller solutions tap into data in a responsible way. The AI Act can promote the use of procurement conditions to put more ethical data sharing and AI deployment into practice. The Digital Markets Act can be leveraged to strengthen rules around interoperability. The European Union now has momentum and opportunity to seize this generational opportunity to shape our digital future; integrating these various pieces of legislation and funding towards developing Public Digital Infrastructure might help put the continent back in the driver seat.

By redistributing power over technology, rather than seizing it, the European Union can empower internet users around the world to benefit from and participate in the digital economy on their own terms, while also championing its own, alternative vision – a vision built on ideas of openness and pluralism – to compete with the reductive Shenzhen versus Silicon Valley dichotomy. Because rather than trying to build the next Google, should we not focus on building the infrastructures that prevent the next Google instead?

3. PUBLIC DIGITAL INFRASTRUCTURE: FROM A PLATFORM TO A PROTOCOL-BASED DIGITAL ECONOMY

Public Digital Infrastructure is not a single tech fix or regulatory intervention, nor is it the kind of (cyber-) physical assemblage we often associate with the term “infrastructure”. Rather, it is a logic made up of a number of technical, governance and funding building blocks, combined to create a shared set of rules and protocols that a new ecosystem of alternative solutions can emerge on top of. This section sets out a proposal for what a tangible model and governance structure for Public Digital Infrastructure could look like. The main ingredients of this approach focus on:

1. Opening up access to data and identity management in a fair and reciprocal way.
2. Devising new governance models and institutions that ensure underlying infrastructures remain open and secure, and
3. Creating the conditions for a vibrant alternative ecosystem of solutions to emerge on top of this model through strengthening interoperability.

To do this well, the logic of the overarching Public Digital Infrastructure model relies on three key pillars: **the development of technical underpinnings to help open up data to the commons and strengthen online identity, governance models fit for purpose, and the generation of a healthy, interoperable ecosystem of solutions on top of it.** These pillars are summarised below and discussed in more depth in Section 3.1 and 3.2.

Generating an ecosystem of healthy, interoperable alternatives:

Public Digital Infrastructure could help us move away from a platform economy, where one player owns a whole suite of tools and can unilaterally set the rules, towards a protocol-based economy, in which we could see a collaborative ecosystem of smaller, interoperable solutions and applications emerge, built on top of this shared set of rules. We could see this as an alternative, parallel app store, made up of open, trustworthy solutions and public goods.

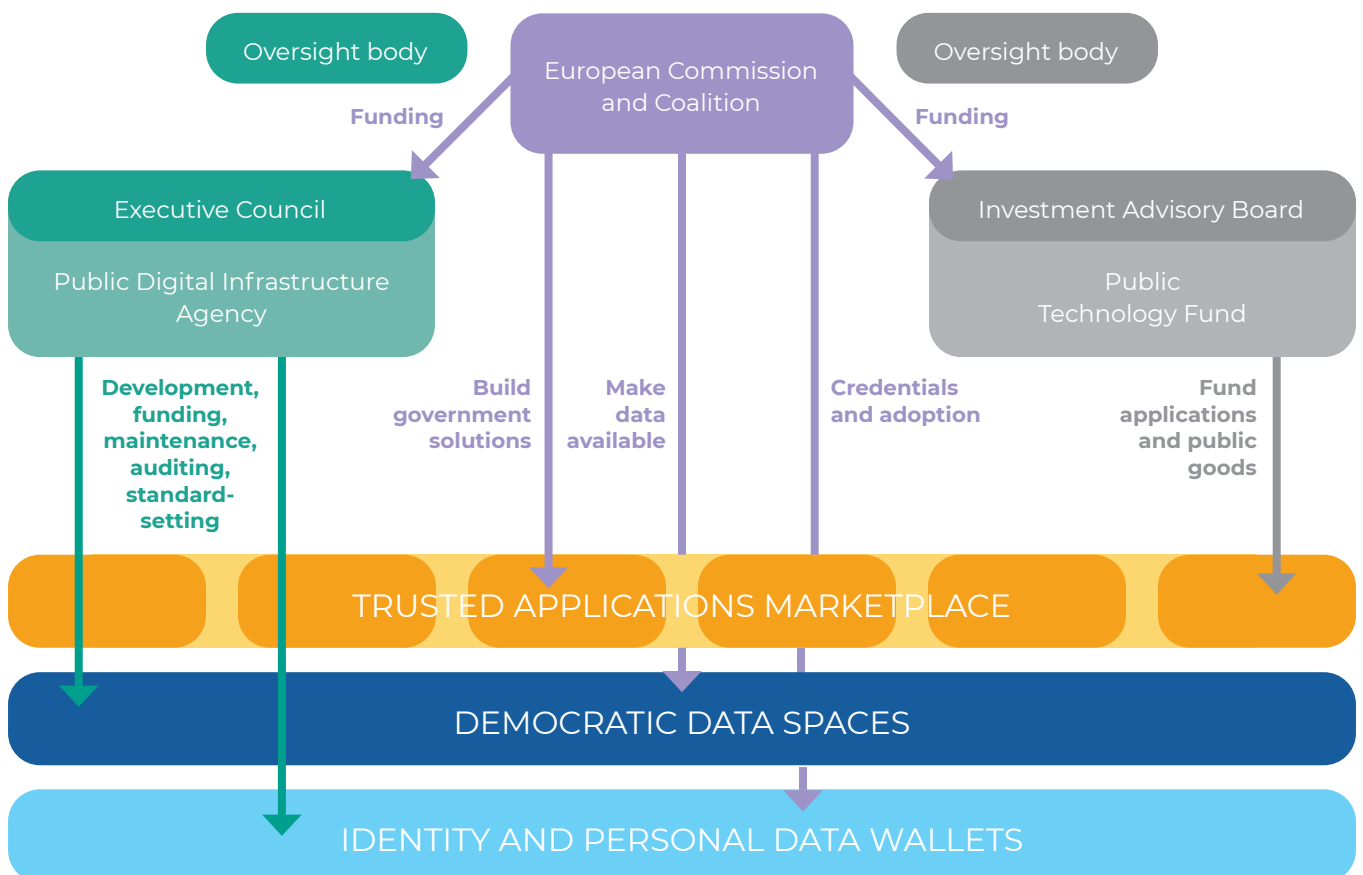


Figure 3: The Public Digital Infrastructure model visualised

Through **collaborative interoperability**, solutions built on top of the Public Digital Infrastructure would proactively set out to integrate their solutions with other tools built on the framework.

To help this ecosystem thrive, the Commission and other governing bodies (from the local level to the supra-national) would seek to leverage their own market shaping-levers, for example through strengthening rule-setting through procurement, and moving their own solutions on top of the system. The European Commission would further provide the funds for an independent **Public Technology Fund**, which would support the development of applications on top of the Public Digital Infrastructure, as well as fund public goods to support the wider ecosystem.

Designing governance models fit for purpose:

No single centralised entity – public or private – would control the underlying Public Digital Infrastructure model; instead, the system would be governed on the basis of a shared set of rules and protocols for, for example, interoperability, data sharing and security. In this model, civil society, trusted public institutions, academia, and the public-interest technology community would be empowered to collaboratively shape the rules, standards and governance models underpinning this shared logic.

To ensure these decision-making processes remain open and representative, but also geared towards effective decision-making, the European Commission would provide the funding for the establishment of a fully independent **Public Digital Infrastructure Agency**, tasked with bringing together the community, and providing resources for maintenance and auditing of the PDI's components.

Opening up data and identity:

Every internet user would be provided with the means to control their own digital identity and personal data online, empowering them to share what they want, with whomever they want, on their own terms. To do this, each user of the Public Digital Infrastructure model would have the right to be issued their **own portable online identity and personal data wallet**, which would allow them to share and pool data on a case by case, consent-based basis.

Developers of applications and services would be able to tap into the user-generated data commons that would result from this pooling in a way that is accountable and fair, rather than feel compelled to amass their own proprietary data lakes in order to compete. We should not imagine these commons as one single enormous, distributed data lake, but rather as a set of data governance mechanisms, ranging

from data commons to trusts, which would be employed and governed depending on the use case and sensitivity and utility of the data at hand. Users would be able to pick and choose which commons to participate in, and solutions would contribute to these commons as a condition of being part of the PDI.

CLOSING THE GOVERNANCE GAP

The European Commission would support the independent development and maintenance of robust and open technical building blocks that would underpin the Digital Public Infrastructure model, such as personal data wallets, data commons mechanisms, and online identity frameworks, and ensure regulatory alignment. In addition to these open data and identity components, the Commission would further support the development of modular public goods that would help strengthen the ecosystem overall.

There is growing momentum around the idea of using government and institutional power strategically to build digital goods and tools that serve the public interest, and open up the digital economy. Many of these proposals focus in particular on the application layer of the internet stack: can we make social media networks that are more democratic and distributed by design? Can we develop open source solutions that would allow online initiatives to reduce their reliance on the large platforms? This paper's proposal, which aims to be complementary rather than in competition with these ideas, places emphasis lower down the stack – on the data, identity and enabling software layers of the system, which in many respects remain worryingly under-governed, and have so largely become the preserve of proprietary, siloed systems.

This paper's proposal for Public Digital Infrastructure would seek to address this large gap in the internet's governance stack by establishing a new Public Digital Infrastructure Agency, which would be empowered to bring together the stakeholder community to set the shared standards and open protocols underpinning it. These efforts would focus on mechanisms to enable data sharing, meaningful consent and identity management, as well as those that would help strengthen security, trustworthiness and collaborative interoperability. Through a shared set of rules, it would become easier for new applications and tools to collaborate with each other, which could help the overall ecosystem of smaller alternatives to gain traction – currently a major challenge. Any one application on its own will often struggle against the much better-resourced incumbents. Building a vibrant ecosystem of market and non-market solutions, where users can seamlessly move between tools (for more on the principle of “collaborative interoperability”, see

3.1), and rely on the trust instilled by universal, portable identity and data storage mechanisms, could well change that.

The aim is to build parallel infrastructure, not to coercively reshape existing models

Building on top of the public digital infrastructure would be open to all, no entity – European or non-European – would need to seek permission to do so. We should not see this as a closed system, or just another platform to plug into, but rather as a new layer of open “code” and modular building blocks any developer can choose to incorporate into their own technology stack. **This logic does not seek to replace or regulate out of existence the current models, but would aim to grow as a parallel, generative model alongside it.** Of course, participating in the DPI model requires reciprocity – solutions built on top of the model need to play by the rules of the system and outsource aspects of identity and data management, while also agreeing to limit their own data collection and enable portability of the data they do collect. But in turn, they benefit from the scale and trust the new model brings – which will particularly benefit new entrants.

Given the increased freedom, choice and security that the Public Digital Infrastructure model would offer users, we can expect that with time even the large incumbents might choose to make their own solutions compatible. To illustrate how this might work, think of the example of email, one of the most emblematic examples of interoperability on the internet working well. Few of us would now be willing to use an email provider that would only allow communications with users of that same provider, if fully open alternatives are available. When interoperability becomes the norm, most users will choose it over lock-in.

The key to making the Public Digital Infrastructure model a success is embedding trust and scale from the outset. A wide net of trusted institutions and other key stakeholders should be involved from the very beginning and play a role in both decision-making around the model’s designs, and the development of initial solutions on top of the PDI. In the deliberate absence of one central, core decision-making actor, building such a diverse coalition would help us strike the right balance between centralisation and decentralisation.²⁵

EUROPE’S ROLE

To allow this Public Digital Infrastructure model to flourish, there is an important role to play for the European Commission as a convener and funder. European institutions would provide the means to ensure governance processes stay open, inclusive and accessible through establishing an independent Public Digital Infrastructure Agency. The Commission, ideally in collaboration with member states and other allies committed to strengthening global openness and democracy, would provide the funding for independent oversight, continuous maintenance and security auditing of underlying technologies and protocols, as well as support the development of user-friendly solutions on top of these infrastructures. Generating such an ecosystem would be a departure from the usual role a powerful institution like the European Commission is comfortable playing, and would require relinquishing some control, but one that it is particularly well-placed to take up.

In the next sections, we will delve into the specifics of each of these components: the technical building blocks, governance models, and levers to incentivise the growth of the ecosystem on top of them. The recommendations in these sections are purposely quite general, as the elegance and strength of the Public Digital Infrastructure model sits in the collaborative decision-making processes underpinning it. Especially the more specific choices for technical building blocks and institutional design in these sections should thus be considered as points of departure for further discussion; final decisions should be made by a wider expert and user community.

²⁵ Decentralisation has become a somewhat tainted term due to its appropriation by the Web3 community (which, rather than embrace genuine decentralisation, simply moves the power elsewhere). This powerful and useful term should be embraced by communities that do genuinely seek to redistribute power on the internet.

3.1 GENERATING HEALTHY, INTEROPERABLE ECOSYSTEMS

This section discusses a number of mechanisms through which we can both on a technical and funding level ensure the growth of the public digital infrastructure ecosystem. The key recommendations we will discuss here are harnessing **collaborative interoperability** to allow the flourishing of a new suite of alternative tools, and the establishment of a dedicated **Public Technology Fund** to support the development of both digital public goods and novel, open applications.

Once the underpinning building blocks that make up the public digital infrastructure logic – the data governance and identity management models, as well as open and robust governance institutions to ensure their continued maintenance, security and inclusion – have been laid, a vital next step becomes ensuring the ecosystem built on top of these frameworks gains traction and provides value to users. If our aim is to build parallel models to the highly centralised incumbents, a decentralised, open “app store” if you will, we need to ensure that there are a sufficient number of trustworthy and user-friendly solutions available to make adoption appealing to users.

It is important to acknowledge that the market alone will not automatically lead to the emergence of the diversity of tools and public goods a thriving new ecosystem requires. Governments and other large institutions should encourage adoption by moving their own tools on top of the PDI, and make compatibility with the various frameworks a condition in funding and procurement calls. Going further, the European Commission should also establish a dedicated **Public Technology Fund**, which would support the development and maintenance of important digital public goods and other exciting, novel open solutions.

This Public Technology Fund, discussed in more detail in the box below, would be empowered to fund and support both new innovation and public goods, as well as provide resources for the continued maintenance and auditing of existing open solutions.

Its main focus would be two-fold:

- 1. Support the development of public goods:** Support financially those key goods and solutions that do not have a clear path towards profitability or sustainability in their own right, but form important components of the overarching public

digital infrastructure, or are key-enablers of innovation on top of it.

- 2. Grow the ecosystem of applications:** Support the development and maintenance of new open tools and solutions on top of the PDI infrastructure to help the framework achieve critical mass, and fill gaps.

Beyond funding new solutions, a strength of the Public Digital Infrastructure model is its ability to create the conditions for new entrants to actually meaningfully participate and grow without having to resort to data hoarding practices of its own. Making it easy for developers to design their tools in accordance with this shared set of clear standards and technical underpinnings is therefore important. Building a thriving ecosystem of solutions can only happen if new and existing tools are able to tap into the data commons effectively, make use of third-party credentialing, and can work well together with other tools in the ecosystem. This means that there needs to be useful data available from the outset, that trusted institutions function as intermediaries in the identity realm, and that there is a clear set of rules in place to help facilitate collaborative integration and, importantly, interoperability between tools.

COLLABORATIVE INTEROPERABILITY

While every successive tech scandal seems to bring with it more public demand for alternatives, it has in practice proven very difficult to capitalise on this momentum and push users to actually switch to new solutions. Alternative, especially open source, tools are often not as user-friendly and stable as the seamlessly smooth and free solutions offered by the technology giants, and also do not benefit from the network effects and data-led user testing that allow the large platforms to cement their positions. But superior user experience and scalability are not the only hurdles.

A lack of data portability – which would enable users to bring their personal data, contacts, and carefully-curated reputations with them across tools²⁶ – makes switching platforms labour intensive for users, and increasingly often also costly. Limited to no interoperability between applications and other solutions furthermore means that users often prefer the convenience of remaining within a single walled-off environment, rather than starting from

²⁶ Think here, for example, of an Uber driver unwilling to give up her 5-star rating to start from scratch at an alternative ride-sharing platform with fairer labour conditions, or a WhatsApp user not keen on losing all existing conversations when moving to Signal.

scratch elsewhere or having to fiddle with APIs and integration processes often deliberately designed to be clunky.

The above challenges have so far proven difficult to resolve. The proposed Public Digital Infrastructure model could contribute to a solution to lock-in through harnessing interoperability strategically. Interoperability comes in many different types and flavours, but on the whole refers to the idea that solutions and systems, even if created by different companies or institutions, should be able to work together. On the internet, email is a particularly well-known and elegant example of interoperability working well – any user can send an email to any other user, regardless of whether they use the same email provider. The internet’s initial logic put interoperability at its core.²⁷ In practice, however, we see that many of the largest actors in the digital economy actively hinder interoperability and portability with other services – the objective has become to keep as many users, and by extension as much data, within their own, self-governed and siloed gardens. WeChat, the Chinese chat-meets-e-commerce-meets-payment-provider-meets-just-about-anything-else superapp, is a particularly illustrative example of this type of functional integration.²⁸ Without challenging the logic and models that make such integration the obvious path forward for services, we will see more such hyper-concentrated superapps emerge.

The idea of strengthening interoperability as a method to challenge entrenched platform power is currently undergoing somewhat of a Renaissance. Cory Doctorow has introduced the idea of adversarial interoperability as a way in which large platforms can be effectively coerced in opening up their services.²⁹ The GDPR, the DMA and other pieces of legislation in Europe and beyond have made provisions for strengthening data portability and aspects of interoperability through regulation (though it should be noted that the former two examples would benefit from more specificity in how data owners should put these principles into practice). Interoperability vis-à-vis the large platforms is important, and legislation mandating, for example, the opening up of APIs for solutions over a certain size should be encouraged. The latest iteration of the DMA includes exciting provisions to, for example, mandate messenger interoperability – which theoretically would make it possible to, for example, use WhatsApp to message peers on Signal.

These proposals are important, but also present us with new challenges. The complexity of the back-end that underpins many of the largest technology solutions, especially those of the largest actors, will ensure that integration and retrofitting interoperability will not be straightforward. Large incumbents might be open to vertical interoperability – simplifying building on top of their platforms – but are less keen on the more impactful horizontal interoperability proposals, such as the idea of messenger interoperability, and are thus unlikely to put much effort in making these types of integration work well. There also remain open questions about what it would mean to, for example, make solutions with different underpinning value systems interoperable – how would we integrate a messenger tool that practices end-to-end-encryption with one that does not, for example?

One way of addressing these challenges is to not just think of interoperability as a coercive instrument, or as solely a tool to open up Big Tech, but rather as a deliberate choice new entrants and solutions can make to seek to collaborate and integrate with peers; the creation of a parallel model alongside the existing vertical giants. **In this public digital infrastructure model, I propose adding to these efforts by focusing on “collaborative interoperability”³⁰ – a concept where different solutions proactively choose to build their solutions on top of a shared logic of data sharing and interoperability, ensuring they can work together as an effective suite of tools.** Think of an open source calendar application, which could easily integrate with an open, encrypted email provider, or event registration tool; all developed and maintained by different creators. Through this shared logic, and collaborative approach – not just on the identity and data layer, but also on the application layer – we could ultimately see a fully interoperable suite of open alternative tools emerge, which can compete with the giant platforms, without exploiting users or infringing on public space online.

GROWING THE ECOSYSTEM OF AVAILABLE SOLUTIONS AND APPLICATIONS

For this cooperative model to work, we first need an ecosystem of tools to exist at all. Trusted institutions with large existing user bases, such as public

27 O'Hara, K. and Hall, W. (2018). *Four Internets: The Geopolitics of Internet Governance*, Centre for International Governance Innovation paper no.206.

28 <https://www.bbc.co.uk/news/business-55929418>

29 <https://www.eff.org/deeplinks/2019/10/adversarial-interoperability>

30 I have previously explored this idea of using interoperability as a tool to create a market for alternatives in a vision paper released in 2020. (<https://research.ngi.eu/wp-content/uploads/2021/02/Vision-for-the-future-internet-long-version-final-1.pdf>). Sophie Bloemen, Alek Tarkowski and Paul Keller explore a similar idea, “generative interoperability”, in an upcoming piece of research funded by NGI Forward.

broadcasters,³¹ academic institutions and indeed governments themselves, could play an important role in incentivising the general public to switch by making their own services available on top of the Public Digital Infrastructure model, and building on top of the same interoperability and data portability protocols and standards. Users might not be so keen to move over to a new social network or small application they are not yet familiar with, but could be much more inclined to do so in order to sign up for a library card, watch their favourite shows on their public broadcaster's online streaming service, or register to vote.

Beyond moving their own services onto the public digital infrastructure, there is more that governments in particular can do to encourage take-up of the model without further centralising the system itself or taking control. The European Commission, as well as national and local governments, should consider putting their spending power at the disposal of promoting shared standards, and bringing more cohesion to their portfolio of funded research, and generally being more strategic about building traction around certain values and principles through embedding it in the technology they fund.

By defining clear requirements for interoperability and data portability in their own procurement and funding rules, governments could ensure that any digital solution built using public funding would use this same logic, which could lead to the rapid proliferation of these models. There is a role for the European Commission to harmonise procurement processes across the continent, and to experiment and open up its own tendering, funding and procurement rules to be more flexible and open to, for example, open source technology.

The European Commission could further kickstart these efforts by establishing a dedicated **Public Technology Fund**, which would provide support for the experimentation with and development, and maintenance of new solutions on top of the public digital infrastructure. This fund should be independently administered and focused on building a wide suite of public goods which could be leveraged by all. There are existing examples of funds already doing facets of this very well, such as the American Open Technology Fund,³² the German Prototype Fund³³ and the to-be-launched German Sovereign Technology Fund.³⁴ The EU's own Next Generation Internet initiative³⁵ also serves as a meaningful

starting point, as do many existing non-profit support funds, such as SIDN in the Netherlands.³⁶ The Public Technology Fund would seek to collaborate and complement these existing efforts. The possible remit and design of such a fund is described in more detail in the box below.

A PUBLIC TECHNOLOGY FUND

Through supporting the establishment of an independent Public Technology Fund, the European Commission could help ensure the resilience, continued openness, and security of key underpinning building blocks, promote growth on top of the new model, as well as fill gaps in the range of available open tools and applications on top of the PDI infrastructure.

What would the Public Technology Fund do?

The Public Technology Fund would be empowered to fund and support both new innovation and public goods, as well as provide resources for the continued maintenance and auditing of existing open solutions.

Its main focus would be two-fold:

1. Support financially those key goods and solutions that do not have a clear path towards profitability or sustainability in their own right, but form important components of the overarching public digital infrastructure, or are key-enablers of innovation on top of it.
2. Support the development of new open tools and solutions on top of the PDI infrastructure to help the framework achieve critical mass, and fill gaps.

The PTF would have full freedom in how it would choose the solutions it funds, and how these solutions would be supported. Given the different sustainability models underpinning open technology, an experimental approach would be encouraged.

What would the PTF fund?

More specifically, the PTF would seek to fund solutions of the following three categories.

31 *The PublicSpaces initiative brings together leading European public broadcasters in an effort to cooperatively build and scale shared open tools, applications and resources, as so to reduce dependency on the existing giants*LINK.

32 <https://www.opentech.fund>

33 <https://prototypefund.de/en/>

34 <https://sovereigntechfund.de/en>

35 <https://www.ngi.eu>

36 <https://www.sidn.nl/en/about-sidn/sidn-fund>

Maintenance and security of core infrastructures:

Support for the maintenance and security auditing of underlying open protocols, standards and other fixes that make up the public digital infrastructure model, as well as a broader remit to support open source building blocks that help strengthen the internet's backbone more generally. Many of these vital building blocks currently largely rely on volunteer efforts for their development and upkeep. In addition to rewarding the hard work these communities provide, offering financial support could also help improve the resilience and security of these components (through more systematised auditing for security flaws, for example) – a vital global public service the Commission could so indirectly provide.

Gaps in key “public goods”: The PTF would also provide support for the development and upkeep of public goods that otherwise would likely not be developed (for example because of a lack of a path to sustainability and business model, or high upfront costs) but would be key enablers for further growth and scaling of solutions on top of the PDI. Think here, for example, of the development of an open European web index (new search engines currently have to rely on those developed by the incumbent giants), improved translation and transcription solutions (especially tools that provide good coverage of otherwise underserved languages) or plug-ins such as comment section or authentication tools. The development of public goods would of course not preclude the development of commercial alternatives on the PDI as well.

New innovations and solutions with a path towards sustainability: For the PDI model to gain traction, it is important we see a suite of tools, applications and solutions built on top of its logic from the outset. Think of the PDI as an alternative app store of sorts - the more options are available, the more popular these alternatives will be with the general user. One way to help facilitate this is through funding interesting proposals and solutions. While the PTF would not take an ownership stake in the solutions it funds, it would set strict conditions and requirements for continued openness, data sharing, and integration with the public digital infrastructure's set of rules and standards. This funding would not be

restricted to European companies and initiatives alone, but would be available worldwide.

With time and through iterative learning about the effectiveness of the fund, its remit could be expanded.

What types of support and funding would the PTF offer?

Light-touch seed funding: Funding should be disseminated in a light-touch way, with limited bureaucracy on the part of the applicant. The cascaded funding model as employed by the European Commission's Next Generation Internet initiative³⁷ can serve as a helpful example here.

The PTF should function as an important central node in facilitating match-making and building networks between the orbit of open PDI solutions and, for example, local policymakers or public institutions keen to move to more open alternatives. This could be a particularly effective mechanism for new open tools to find a pathway to sustainability.

UX and design support: One key barrier open tools often face is a lack of user friendliness and good design. In those cases, just providing funding might not be the most effective way of achieving growth and adoption. The PTF could provide UX support and user testing facilities to reduce this barrier.

Open challenge models and contests: Beyond disseminating funding through more traditional means, the PTF would, for example, have the freedom to run more experimental challenge models, where teams of open source developers would be tasked with developing prototypes to fulfil a preset purpose.

Bug bounties and security audits: The PTF would similarly run bug bounty programmes (modelled after the European Parliament's successful EU-FOSSA initiative),³⁸ and perform security audits on key tools.

Trustmarks: The possibility of establishing a trustmark or accreditation function with either the PTF or the PDI governance body, should be explored. Trustmarks could help improve public trust in solutions, and help smaller, fair tools to gain traction.³⁹

³⁷ <https://www.ngi.eu>

³⁸ The EU-FOSSA project (Free and Open Source Software Auditing) project was a European Parliament-sponsored initiative, which aimed to increase the security and integrity of critical open source software, through, for example, bug bounty programmes.

³⁹ Elliot, H. (2020). *A Case for Digital Trustmarks*, NGI Forward.

How would the PTF be governed and funded?

The PTF would be fully independent. Funding would be provided by the European Commission, but the Commission would not have any involvement in the funding decisions or the day-to-day governance of the fund. A natural initial source of funding could be through utilising part of the NextGenerationEU⁴⁰ programme, and adding the building of thriving, open public goods underpinning the application layer a component of the European Commission's Digital Principles agenda currently under development.⁴¹ As the allocation of most of these funds is currently being decided-upon on a Member State level, some further coordination would be necessary; in the longer-run, there would ideally be a dedicated direct Commission-funding line to ensure continued support and increase efficiency.

The initial conception of this fund as described in this paper is ambitious, and would ideally receive significant funding to support the development of costlier infrastructures such as a universal data wallet. A multi-tier approach could be conceived, where an initial pilot is run as a proof-of-concept. The European Commission's existing Next Generation Internet initiative⁴² would be a natural home for such an effort.

Beyond funding from the European Commission itself, further financial support from member states, and possibly also independent foundations, should be encouraged from the outset. This would help ensure a broader base of support, removes single-points-of-failure (what if a core funding source suddenly falls away?), increases the total amount of funding and, importantly, creates a built-in market for funded projects and solutions.

The day-to-day management of the fund would be managed by a small, permanent staff, tasked with outreach and dissemination of funds, and the management of a small in-house team of UX designers, developers and security experts. Funding decisions would be made in collaboration with a revolving, democratically-elected advisory board (this could be through nominations from the PDI governance body), made up of technologists, members of civil society, and others with a clear stake and valuable expertise.

Similar models

The Public Technology Fund would in part be modelled after the US Open Technology Fund, launched by Secretary Clinton during the first term of the Obama administration.⁴³ The OTF, which is funded by the US Foreign Office but operates independently, focuses on funding open tools in the privacy and communications realm to help dissidents worldwide. The remit of the European Public Technology Fund would, as described be above, be slightly broader, and complementary to the OTF's core objectives.

The German Prototype Fund and the to-be-launched German Sovereignty Fund, the EU's own Next Generation Internet initiative, and many existing non-profit support funds, such as SIDN in the Netherlands also serve as inspiration. The Public Technology Fund would seek to collaborate and complement these existing efforts.

40 https://europa.eu/next-generation-eu/index_en

41 <https://digital-strategy.ec.europa.eu/en/policies/digital-principles>

42 <https://www.ngi.eu>; this report was developed as part of the NGI-funded NGI Forward project.

43 <https://www.opentech.fund>

3.2 GOVERNANCE MODELS FIT FOR PURPOSE

The design of public digital infrastructure relies not just on technical building blocks and creating a new suite of new, open solutions, but perhaps even more importantly, also on robust and open governance frameworks that ensure trust in the underlying systems and rules. This section describes a potential design and remit of a new independent institution, a **Public Digital Infrastructure Agency**, which would be tasked with facilitating the collaborative and transparent development and maintenance of underlying open standards, protocols, and other technical and legal building blocks, and ensuring the coherence and integrity of the overarching system.

The PDI Agency would be funded by the European Commission (and potentially also like-minded peers), but governed independently through an accountable, community-led and democratically-elected governance council. The main aims of the Agency are to ensure the trustworthiness and openness of underlying building blocks and decision-making processes, to foster collaboration and the continued maintenance of technical components, and ensuring members of the open technology community are fairly rewarded for their work on the development of these public goods.

This can be summarised in three clear tasks, further elaborated on in the box in this section.

Decision-making on open protocols and infrastructures:

through convening the relevant stakeholder community in regular assemblies and working groups, the PDI Agency would foster the development of shared open protocols and infrastructures for, for example, facilitating interoperability, data pooling and identity management.

Technical development of underpinning building blocks:

the PDI Agency would both have its own small, technical staff to build components of the underlying public digital infrastructures, and have the means to provide remuneration to members in the open technology community to do so.

Continuous maintenance and auditing:

To ensure the continued security and flexibility of the underpinning components, the PDI Agency would undertake regular audits and support to continued maintenance of the various parts.

As we think about effective governance and the design of such a possible new institution, a central guiding principle should be striking the right balance between centralisation and decentralisation. Too much centralisation, and we would risk repeating the exact same mistakes discussed earlier in this paper.

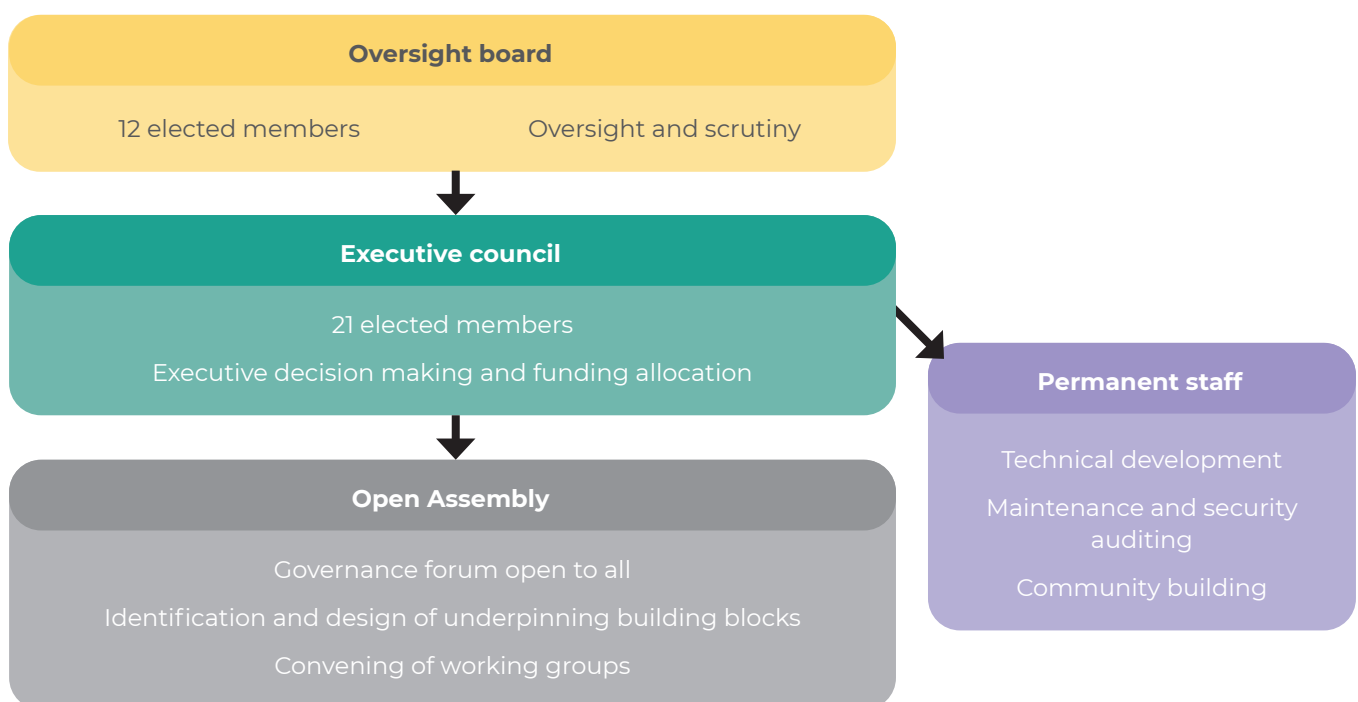


Figure 4: The Public Digital Infrastructure Agency: a proposed design

Given the sensitive nature of our personal data and online identities, mechanisms governed by a single national government or supranational body like the European Commission would furthermore likely not garner the requisite public trust to scale beyond use for specific government services only. We might not mind using a government-issued e-ID to pay our taxes online, but fewer of us would be comfortable using that same ID to sign up for sensitive and private services elsewhere. Top-down private sector attempts to scale new data governance models⁴⁴ or to create an ecosystem around portable, universal identity models have so far also largely failed to gain real traction – again because of a lack of trust and flexibility. Beyond issues of trust, top-down systems controlled by a single actor would also generate new single points of failure, and would again introduce unaccountable actors able to unilaterally set the rules in their slice of the system.

A completely ungoverned, permission-less model has however also proven not to work. Decentralised grassroots initiatives, which rely on serendipity and the somewhat spontaneous emergence of a community of development around them, have in the past often not surprisingly failed to gain traction – especially in the case of solutions further up the technology stack. The strategic mobilisation of a wide and diverse community from the outset is necessary, as is ensuring processes are in place to reach agreement on which models to champion as a community. We currently see a proliferation of, for example, valuable new identity frameworks, but these solutions will not see widespread adoption unless there is a concerted effort to allow it to do so. We need to, as a community, be able to make the kind of decisive choices (“pick winners”) necessary to allow a broader coalition to coalesce around an agreed set of standards and models.

The answer, thus, lies somewhere in the middle between these two extremes. This paper’s concept of Public Digital Infrastructure relies on open and transparent, yet also centralised decision-making in the lower-lying levels of the system through the Public Digital Infrastructure Agency, but then allows decentralised, permission-less development on top of this set of shared rules. From the outset, involvement of large, trusted actors is necessary to help build momentum, to improve the scalability and design of services, and to show the general public

these solutions can be trusted, but focus would simultaneously be on involving new, smaller actors, and ensure they too are able to have their voices be heard and needs reflected in early designs.

The Public Digital Infrastructure Agency⁴⁵ would not just be tasked with coordinating the wider multi-stakeholder community around finding agreement on a shared set of standards, but also ensure the continued modular updating, security auditing and maintenance of the agreed underlying systems, oversee the design of user-friendly, universal tools and interfaces, and promote the growth of the ecosystems on top of it.

A NEW PUBLIC DIGITAL INFRASTRUCTURE AGENCY

The Public Digital Infrastructure Agency would be a new, fully independent body funded by the European Union, tasked with establishing processes and frameworks for the development and maintenance of the PDI’s underlying standards and protocols, for example for data sharing and identity management, cyber security and, importantly, provisions to ease interoperability.

What would it do?

The Public Digital Infrastructure Agency would convene the relevant global stakeholder community to collaboratively decide on the design and logic of the technical and legal components of the Public Digital Infrastructure model. While these internet governance processes should be open, democratic and welcome a diversity of views, emphasis should be on eventually “picking winners” among the myriad of possible models and protocols that could underpin the PDI. Reinvention of the wheel and fragmentation remain a key challenge in the battle to build alternatives. Only through a shared, unified logic can we enable a transition from the centralised platform economy, to a collaborative and pluriform open protocol-based digital economy. The adoption of these standards can be further promoted by governments and trusted public institutions encouraging their use from the start.

To ensure security, robustness and a fair representation of the various stakeholder groups involved an elected, fixed-term Executive Council

⁴⁴ Many of these have focused on monetising personal data for the user.

⁴⁵ This body’s funding model would in some ways be loosely modelled after the initial pre-transition model the US Department of Commerce deployed to support ICANN, the nonprofit that continues to maintain the internet’s vital domain name system. The US government had no oversight or control over its daily runnings, but did provide the financial means for the agency to support itself. The ownership model behind ICANN, however, was not without its flaws – as the continued international pressure on the United States to relinquish its control over this fundamental function (and indeed, ultimately led to ICANN becoming independent). A new, government-sponsored body that provides key infrastructure needs to learn from this experience, and ensure governance processes remain truly open, accessible and representative. Funding sources should further be diversified. <https://www.icann.org/en/system/files/files/annual-report-2014-en.pdf>

would be tasked with signing off on final decisions and ensuring the integrity and robustness of the overall PDI system, as well as identify future development and design needs.

Beyond bringing agreement to the community, the PDI agency would also be tasked with ensuring the maintenance and the iterative improvement of underlying building blocks, and design of core applications (such as the data wallet and identity tools). There are some open questions to be answered on whether the Agency would also be responsible for, for example, providing larger, more expensive infrastructures such as maintaining a truly open European cloud or Web Index. This is not part of the initial conception of the model, but could well be.

What would the Agency's remit be?

Agree on a shared set of open standards through inclusive and transparent processes.

Proposals and specific designs would be put forward and agreement reached during General Assembly meetings, and then rubber-stamped by an elected Executive Council, to finally be put into practice by working groups, members of the open technology community, and the Agency's permanent technical staff.

Ensure the continued robustness and security of underlying frameworks. Regular security audits and bug bounty programmes, would be run alongside transparent development and maintenance processes, which together would ensure the continued modular improvement and security of the underlying framework.

Fund development of open protocols and standards. The PDI Agency would have the budget to fund members of the wider technology community to further develop and finetune necessary underpinning code and building blocks.

Development of core resources and goods. In collaboration with the Public Technology Fund, the Agency would also be empowered and provided with the resources to make its own investments to support the development of open protocols and technologies underpinning the PDI. The slightly overlapping roles the PTF and PDI Agency would play is a deliberate choice; redundancy in the system in this case helps bring more stability and robustness.

Awareness raising and promoting growth. The Agency would also have an important role to play in promoting development on and adoption of the Public Digital Infrastructure, and in communicating its benefits to policymakers, the technology community and the general public.

A proposed governance structure:

Open assemblies and working groups: Regular Open Assemblies will be held; participation would be open to all around the world. During these Assemblies, delegates would collaborate, debate and vote on technical and policy issues to do with the underpinning infrastructures of the PDI (What kind of identity mechanism will be preferred? Will an existing model or solution suffice, or should design start from scratch? Do existing frameworks require updating or patching due to a changing threat and security landscape, or because improved building blocks have emerged?).

Assembly meetings would also focus on identifying gaps and needs for solutions and public goods to be built on top of the PDI (Are there any public goods the PDI Agency or the Public Technology Fund should consider funding? Are there any additional elements that might be added to the framework (for example a shared payment mechanism), are elements of the system not scaling sufficiently and how can that be addressed?). Working groups, which can meet more regularly during the year, can be formed to further elaborate on some of these topics.

Lastly, during the Open Assemblies, annual elections would take place to elect a portion of the members of the Executive council and oversight body. These elections would be held within the respective stakeholder pillars, to ensure fair representation. Participants would be classified as members of a specific voting pillar (technology community, civil society, private sector, policymakers, general public, etc.) in order to ensure diversity of perspectives and prevent take-over by one of the pillars; whether actors who receive significant corporate or government funding could be considered neutral members of, for example, civil society would be subject to a vote by the Executive Council.

Executive council: While anyone can participate in the open decision-making meetings, a permanent decision-making board – made up of members from the open source – and wider technology community, designers, legal experts, civil society and media, private and public sector, at a set ratio and voted in within their own pillars for single terms – would be put in place to oversee these processes.

The executive council would also be empowered to set the priorities and future trajectory of the Agency moving forward, and scrutinise decision-making processes and the governance and growth of both the Public Digital Infrastructure model and the Agency itself.

As originally envisioned, this Executive Council would have 21 members, who each hold an equal vote. These twenty-one members will represent the various stakeholder pillars at a fixed ratio (Open technology community, civil society, public sector and private sector).

Members would be elected for a period of four years. Membership would be remunerated, and depending on the ultimate design of the Agency might either be a full-time or part-time engagement. Mandates could be renewed one time (through re-election).

Oversight board: A second, smaller oversight board would be tasked with scrutinising the work and decision-making of the executive council itself, as well as the technical robustness and financial management of the agency's permanent staff. This oversight board, which would in some ways operate like a more traditional corporate or charity board, would be made up of twelve members. These members, which should have a fair balance between legal, financial, ethics and technical expertise, would be selected for a once-renewable five-year term, and would only be involved with the Agency on a part-time basis.

Members could be selected through a nomination and election process: four members could be selected through a voting process in the annual general assembly, four members could be elected by a pool of former members of the Executive Council and oversight body, four members could be put forward by the permanent staff itself.

Permanent staff: The Agency would have a permanent staff which would organise the various assemblies and ensure the smooth running of the decision-making council and oversight body, facilitate independent security and legal auditing cycles, and have a technical and design team on staff to put in practice the decisions of the governance layers, and perform security audits.

How would the Agency be funded? The European Commission would provide funding for a guaranteed amount, over a guaranteed number of years (ideally initially for a minimum of five, or even ten years, rather than follow a political-cycled renewal process) to enable the independent administration of the Public Digital Infrastructure Agency.

The European Commission would be the main funder of the agency, though the immediate buy-in from EU member states and potentially also from like-minded peer nations such as the United States, the United Kingdom, Canada, Switzerland, Brazil, and Japan, should be encouraged.

Diversification of funding sources would help increase trust and transparency in underlying processes, reduce single points of failure should continuation of funding reach future bottlenecks, and help strengthen global support (as a single funder might give off the appearance of a political, centralised project).

Funding would allow the Agency to maintain a permanent staff, would cover remuneration for members of the multiple decision-making organs and the organisation of standard-setting meetings. Funding would also support the actual development and running of the infrastructures themselves, as well as the design of basic enabling applications (e.g. data wallets and data exchange mechanisms) on top of it.

Who can take part in decision-making processes? To increase trust and to ensure these models would not just represent the interest of the usual suspects, it would be key that governance processes remain open and represent the views of all. This is in part a function of good design of the various decision-making organs within the Agency (diversity, distribution of power and fair representation are part of the core design of, for example, the Executive Council). Various stakeholder groups would be represented at a fixed ratio, ensuring no single interest group can dominate.

Many of the existing internet governance fora experience significant barriers to entry due to the significant time and cost associated with participation, as well as the jargon-heavy nature of debates, which require significant prior knowledge and time to stay abreast with. In designing the Assembly meetings, which are open to anyone, we should be cognizant of the existing barriers to entry so pernicious in existing internet governance fora, and actively strive to reduce them. This can be achieved through proactively challenging needlessly technical language and jargon-heavy in-group dynamics, as well as the resource-intensive requirements of participating. Bursaries would be made available to underrepresented groups and geographies.

While the Public Digital Infrastructure would be a European initiative, the possibility to participate should be open to all. If Europe's intention is to export this open model, bringing on board a variety of perspectives and viewpoints is key to ensure vibrancy and legitimacy.

3.3 HYPOTHETICAL USE CASES

To help illustrate what kind of potential solutions and frameworks could be built on top of the interlocking building blocks described in the previous sections, we will now explore two potential use cases. Of course, given the open and permissionless nature of the public digital infrastructure model as proposed, a far larger number of such examples could, and hopefully would, be imagined – from the education sphere, to health, to search and discovery.

1. Keeping the benefits local: reimagining the gig economy.

There are few examples more emblematic of the asymmetry of platform power than those brought to bear in the gig economy. Ride sharing companies, propped up by venture capital-backed treasure chests, are able to price existing taxi companies out of the market, and often subject their drivers to exploitative labour practices and platform lock-in to further drive down costs. Food and grocery delivery services, through their local market power, effectively strongarm restaurants and shops into accepting increasingly thin profit margins,⁴⁶ and negatively impact the livability and affordability of the communities where they operate.

One way to break through these harmful dynamics, where the costs and negative externalities are borne locally, but the profits flow elsewhere, is through building local alternatives. There have been many exciting attempts to do just that. Think for example of initiatives like Consegnetiche in Bologna,⁴⁷ which provides a coop alternative to existing delivery apps, or FromTo in Vancouver,⁴⁸ an initiative by local restaurants to challenge low-margin food delivery companies. While there have been notable successes among these initiatives, local alternatives usually find it hard to gain traction, and face an uphill battle when it comes to challenging the user experience and critical mass the large incumbents offer.

One way of lowering some of these barriers is through building flexible, open solutions on top of the Public Digital Infrastructure model, which communities anywhere are able to repurpose and adapt to their own needs and specifics. Currently local groups of drivers or restaurants would usually need to build their own tool from scratch, a significant barrier, and needless reinvention of the wheel. The

Public Technology Fund could instead invest in the development of a “drag-and-drop” application, made up of a flexible, easy-to-use user interface, and accompanying building blocks such as payment systems, GPS integration, and so forth, which can be fairly easily compiled. User and driver identity would be easily and security verified through the identity aspect of the PDI; data on travel patterns efficiently and safely shared between solutions. While there are of course still regulatory, legal and financial barriers to starting a competitor, providing a solid and secure design framework as a free public good will help reduce technological barriers and increase robustness and trustworthiness of grassroots alternatives.

This idea of shared local resources can be extended and strengthened further through the interoperability aspect of the Public Digital Infrastructure model. One barrier to adoption for local alternatives is a lack of name-recognition and awareness, especially among visitors and newcomers to a community. A tourist arriving in an unfamiliar city is likely to default to one of the main ride sharing apps already installed on her phone, rather than seek out the local option. Collaboration and integration between different cities and towns could help make this switching experience as easy for the local alternatives.

2. New revenue models for media

Digital and print media has perhaps been the industry hardest-hit by the new economics and centralisation of power in the digital economy. Especially those publications and journalistic outlets that depend on digital advertising revenue for their survival have struggled to carve out an (exceedingly fragile) pathway to sustainability. Quality outlets are now often effectively forced to bend to the opaque and unaccountable rules set by the platforms that drive most of their traffic. This overreliance on the whims of black box algorithms, which govern which content finds an audience and which does not, has led to a situation where digital media outlets find themselves compelled to “optimise” their outputs based on what their intermediaries tell them generates quick clicks, and thus ad revenue,⁴⁹ rather than produce journalism that serves the public interest.

To ensure journalists can continue to play their important civic role in a political climate where

⁴⁶ See for example: <https://www.theguardian.com/global-development/2021/apr/25/deliveroo-tech-delivery-restaurant-service-dark-kitchens>

⁴⁷ <https://consegnetiche.it>

⁴⁸ <https://bc.ctvnews.ca/vancouver-restaurant-owner-creates-food-delivery-platform-with-no-commission-1.5298967>

⁴⁹ There is reason to believe that adtech and programmatic advertising is itself somewhat of a mirage, a low ROI-card house about to collapse. Tim Whang's subprime attention crisis on this topic is well worth reading. <https://logicmag.io/subprime-attention-crisis/>

neutral, trustworthy reporting is especially vital, new business models are desperately needed. Several new approaches could be explored through the Public Digital Infrastructure model.

First, upending the data concentration logic now at the core of the digital economy, would allow media outlets to better retain data and collect better insights on their own readers than is currently the case. This could help outlets improve their own fair analytics capabilities and, for example, explore less-invasive, context-dependent digital advertising models more effectively. Here collaboration between different outlets could well be imagined.

A greater diversity of social media networks grown on top of the Public Digital Infrastructure could also help media diversify the intermediaries it relies on for content dissemination (whether or not these new networks will rely on advertising revenue or not). The Public Technology Fund could also play an important role in supporting the development of public goods such as open translation solutions, authentication mechanisms (such as CAPTCHAs) and portable online identities, which would allow media to further wean off their dependency on the large incumbents.

A third, more exploratory approach could be through facilitating micropayments. While the internet has made it easier than ever before for readers to access a vast and diverse array of content across all languages, more and more of this content has naturally disappeared behind paywalls. Single-publication subscription models mostly benefit the largest and most well-known publications (also here do we see a winner-takes-all dynamic at play),⁵⁰ while public opinion polling suggests readers would prefer to be able to pay for single articles from different outlets, rather than limit themselves to just one.

Over the years, there have been many attempts to create tools and partnerships between media outlets to allow readers to purchase single articles (Dutch start-up Blendle⁵¹ was a particularly noteworthy example) – none of which have unfortunately been able to gain sufficient traction, despite buy-in from large publishers and publications.⁵² One often-cited reason for why these initiatives have not been able to take off, is the cumbersome nature of the payment process and associated higher cost per piece. The Public Digital Infrastructure model could make such cross-platform payments much easier. With time, we could consider adding a universal micropayments mechanism to the Personal Data Wallets and Identity frameworks.

⁵⁰ It is perhaps interesting to note that this winner-takes-all dynamic, a pervasive trend we see across the layers of the system of the internet we always end up with a handful of winners, also manifests itself in the digital media sphere. There are a small number of publications, mostly in the Anglo-sphere, which have been able to find sustainable pathways to growth, and have found ways to thrive (e.g. the New York Times and the Financial Times). While it is a good sign that quality publications have been able to build large subscriber bases, this is a model that can not always necessarily be replicated in many of Europe's far smaller language markets. More efforts to experiment with sustainable business models for smaller readerships need to be explored. (See, for example: Kleis Nielsen, R. (2021) *Invest in tools and talent, and newsrooms can finish the job*, Nieman Lab.

⁵¹ <https://medium.com/on-blendle/blendle-a-radical-experiment-with-micropayments-in-journalism-365-days-later-f3b799022edc>

⁵² <https://www.niemanlab.org/2019/06/micropayments-for-news-pioneer-blendle-is-pivoting-from-micropayments/>

4. RECOMMENDATIONS AND NEXT STEPS

The European Commission must seize the opportunity offered by the rising public demand for alternatives, the shifting global technology (and geopolitical) landscape, and availability of post-pandemic recovery funding to take the lead in nurturing the conditions for Public Digital Infrastructure to thrive. But, as this paper has attempted to make clear, it can only do so through radically reimagining its own role as a market shaper and creator, and through working in close collaboration with like-minded partners.

Building a successful ecosystem on top of the public digital infrastructure model will require bold action by governments. There is however also a vital role to play for civil society and large, established institutions in building trust and good governance practices; for data owners – both public and private – to open up access; and for the open technology community to develop and maintain technical building blocks. Only through a broad based coalition, involving government, the private-, and third sector, can we ensure these various components come together effectively.

I will end this paper with a number of practical, short to medium-term recommendations to support the development and growth of robust public digital infrastructure, and a vibrant ecosystem of open solutions on top of it.

GENERATING HEALTHY, INTEROPERABLE ECOSYSTEMS:

The European Commission, preferably in collaboration with like-minded member states and allies elsewhere, should make resources available for the establishment of an **independently-run Public Technology Fund, dedicated to funding the development and maintenance of open solutions and tools, and digital public goods** on top of the standards and protocols that make up the new Public Digital Infrastructure.

Members of the coalition, especially those institutions with existing networks and built-in user bases, such as large public institutions and public broadcasters, should commit to **moving their own solutions onto the public digital infrastructure model**. Through familiarising a broad base of users with the benefits of this model, trusted, large organisations can lead the way in helping smaller initiatives flourish and reach critical mass.

The European Commission and other institutional funders of technology, such as research bodies and charitable foundations, should become more proactive in **stipulating the use of the standards and protocols** underpinning the public digital infrastructure model (such as standards for data portability, data sharing and interoperability) as part of their **procurement and grant conditions**. This will help these standards gain momentum, and allow for more cohesion between newly developed tools, and prevent costly lock-in.

The European Commission should furthermore **strengthen its own rules for data portability and interoperability** in future relevant legislation, for example in the Digital Market Act (recent versions of the upcoming Act already include provisions for messaging interoperability, which is promising).

BUILDING TRUST THROUGH ROBUST GOVERNANCE:

The European Commission, in collaboration with like-minded peer nations as well as the wider technology community, should provide the funding and support for the establishment of a **Public Digital Infrastructure Agency, a new, fully-independent, multi-stakeholder governance body focused on setting shared open standards around, for example, data governance, collaborative interoperability, and identity management**.

The European Commission should play a **global leadership role in ensuring internet governance processes**, both those part of the new public digital infrastructure as well as those covered by existing, aligned governance bodies, remain **open, transparent and inclusive**. This can be achieved through active participation in said bodies, careful institutional design which prevents concentration of power and reduces existing barriers to access, and the making available of resources to those voices otherwise underrepresented.

The European Commission should help reduce the fragility of the internet's underpinning infrastructures by **promoting the adoption of open technology and supporting its maintenance** – especially of key underlying protocols and frameworks, and provide funding to support auditing,⁵³ issuing of trustmarks, and other security-enhancing mechanisms. Harmonisation and simplification of procurement processes, often a barrier to the adoption of open

⁵³ See for example the [EU-FOSSA project](#) (Free and Open Source Software Auditing) project, which was a European Parliament-sponsored initiative, which aimed to increase the security and integrity of critical open source software, through, for example, bug bounty programmes as a potential model.

alternatives, should also be on the top of the Commission's agenda.

The European Commission and other public and private funding bodies, should promote the adoption of the open standards developed through the PDI Agency by **encouraging or mandating their use as part of procurement and grant conditions**. The viability of formally mandating their use as part of upcoming legislative proposals should also be explored.

OPENING UP DATA AND IDENTITY

The European Commission, ideally in collaboration with like-minded peer countries and funders, should make resources available to support the development of a set of protocols, as well the design of a **secure personal data wallet** and **self-governed online identity** available to all internet users.

Members of the coalition, especially government and larger, data-rich institutions, should commit to **opening up, where responsible, their data through new commons and trust mechanisms**, and function as trusted intermediaries in providing identity credentials. Initial traction and support from trusted institutions is a key prerequisite for making the solutions built on top of the digital public infrastructure scale successfully and provide value to users from the outset.

The European Commission should harness the opportunity offered by the upcoming **Data Governance Act**, which currently makes provisions for the creation of vertical-focused data spaces, to unleash valuable data from its siloes in a responsible manner. By **extending the concept of data spaces to not just include industrial, but also personal data**, the European Commission could help support the realisation of the proposed Personal Data Stores element of the proposal set out in this paper.

The European Commission should similarly consider taking a bolder approach in setting out its strategy for a common, European identity system. The **framework for a European Digital Identity** should look beyond using online identity as a tool to facilitate interactions between government and citizens alone, but explore decentralised models which could help **construct a more universal identity model and counter the increased privatisation of online identity management**.

Over the past decade(s), it has become all too clear that many of the fundamental pillars underpinning the digital economy are no longer fit for purpose; that the internet itself now just works for the few, not the many. The good news is that we have most of the technical and governance building blocks at our disposal, as well as the political momentum on our side, to radically rethink how we want the internet to work instead.

Acting on the above recommendations, some of which might be ambitious but all within the remit of the relevant bodies to explore, will allow us to make great strides in building a truly open alternative that gets at the root of some of the core challenges discussed in this paper, and helps strengthen the "open" in open strategic autonomy. The internet is an important public good; it is time we treat it as such.

**NEXT
GENERATION
INTERNET**
INTERNET OF HUMANS



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