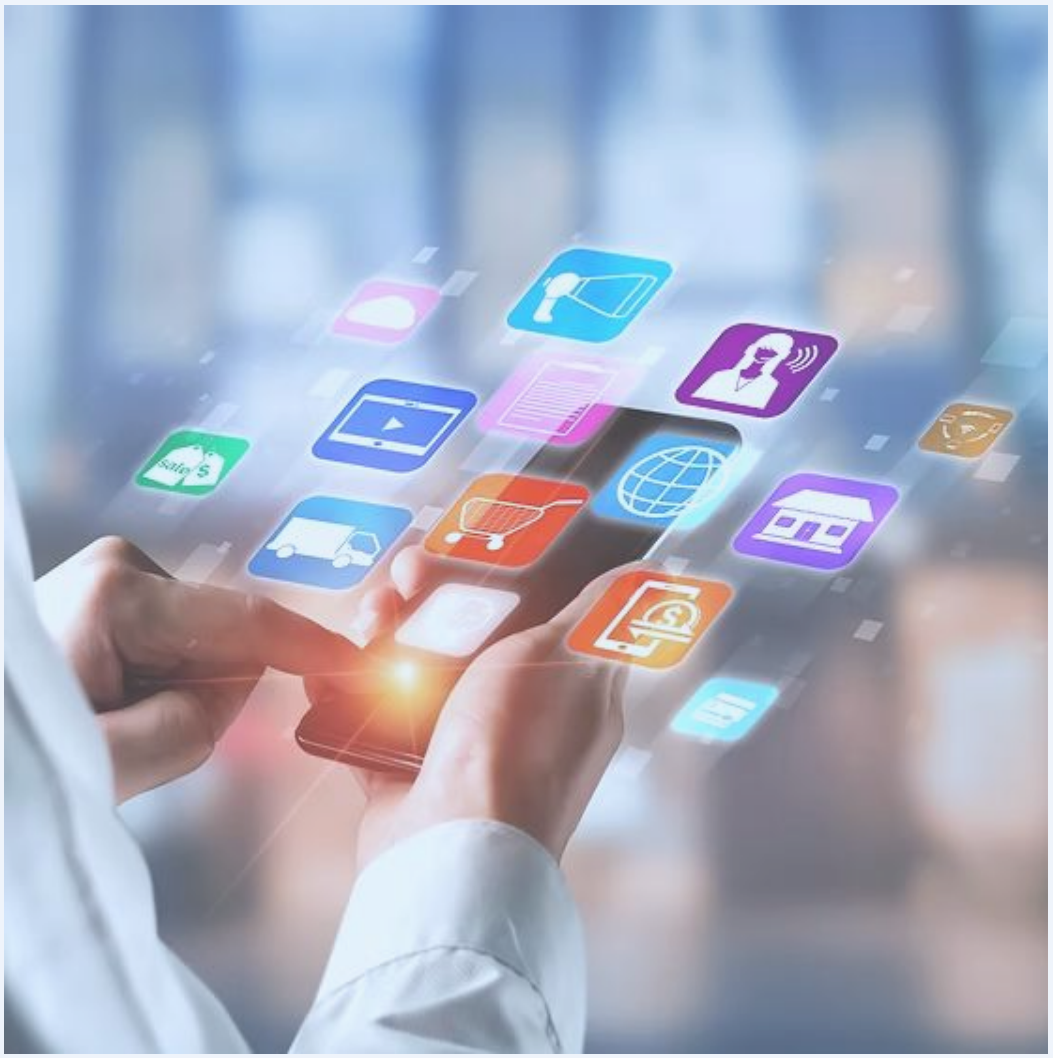
Promoting Digital Transformation and Economic Growth Through Interoperable Digital Identity



NEXTRADE GROUP
World trade is changing. Are you?

Table of Contents

1. Introduction

A digital ID – a verified credential used to authenticate a person and issued by a trusted entity – is like a master key that opens many doors in a digital society. A digital ID can prove the identity of a person (who a person is, whether in a face-to-face setting or remotely) and the ownership of physical and digital assets. It can also help prove permission, such as licensing, permits, and accreditation, as well as legal acceptance, such as issuing and signing of a legally bound document.

Digital IDs are part of a "digital identity" – a broader term that includes other aspects of online activity by an individual or entity, such as browsing history, purchasing patterns, and online credentials such as usernames and passwords.

The United Nations has highlighted "legal identity for all" as a key 2030 Sustainable Development Goal. Digital IDs amplify the envisioned gains from a paper-based legal identity: a digital ID is much like a traditional paper credential, only with far greater scale and user empowerment.[1]

Digital IDs are increasingly adopted around the world. In a recent mapping, the University College London Institute for Innovation and Public Purpose finds that 150 economies are rolling out, piloting, or planning a digital ID.[2] Data is sparser on the use of digital IDs – but digital IDs are already nearly universally adopted in such digital frontrunner economies as Estonia, India, Sweden, and the UK.

However, dropping a digital ID into a society is only a start for enabling IDs' many potential use cases and securing its economic benefits. Rather, governments should seek to build digital IDs that interoperate with other services. Such interoperable digital IDs open many opportunities for their users, such as accessing public services, opening bank accounts, applying for credit, accessing transcripts and healthcare records, signing contracts, voting, selling and buying properties, forming rental agreements, and more. Digital IDs also underpin mobile driver's licenses that can, among other things, validate a person's age.

Research suggests that digital IDs, and especially interoperable IDs, create economic efficiencies. They dramatically lower governments and businesses' costs of confirming people's identities, facilitating service provision.[3] Holders of interoperable digital IDs save time: Estonia's e-ID, which enables users to shop and vote online, sign documents digitally, access healthcare records, and manage banking and business, among many other use cases, helps Estonians to save five full days each year.[4] Similarly, Ukraine's digital platform Diia allows Ukrainians to use their smartphones as a digital ID to access a wide range of government services.[5]

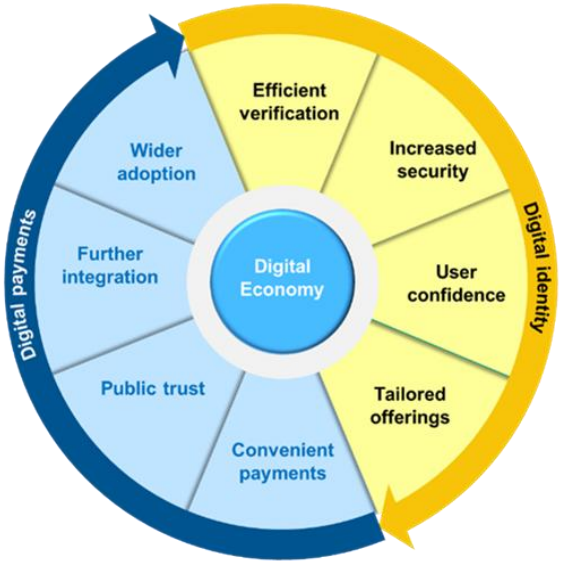
In turn, governments can use digital IDs to streamline their workflows, reduce fraud, and deliver services at scale, as was accomplished globally during the COVID-19 pandemic.

For economies seeking to promote the adoption and use of digital IDs, an excellent place to start is to promote the use of digital payments. After all, the use of payments helps users develop affinity for online authentication processes – which digital identity will help enhance (figure 1).

Brought together with payments and other digital services, a digital ID is likelier to diffuse across society and translate into economic gains.

Interoperable digital IDs can also be one way for governments to help promote the rise of an ecosystem of financial and other service providers – such as buy-now-pay-later apps, online lenders, telehealth companies, and digital mailboxes – that leverage digital IDs to authenticate potential customers and gain new users.

Figure 1 – Digital ID and digital payments to power the digital economy



Source: Visa (2025).

An interoperable digital ID essentially opens many doors in society and economy. The gains from an interoperable digital ID amplify when the ID interoperates with its counterparts in other countries and with public and private solutions across borders. As a key example, the European Union is progressing toward a continental eID wallet whose holders in any EU member state can prove their identity and access available services in another EU member state. However, cross-border digital ID interoperability use cases are still far from harnessed, holding vast latent potential for economic and trade gains.

To move toward such cross-border approaches, digital IDs should be backed by technical and regulatory interoperability – alignment of national legal frameworks and standards for performing Know Your Customer (KYC) and Anti-Money Laundering (AML) compliance.

However, the understanding of the degree of interoperability of ID systems with other services and across borders, the various use cases enabled by digital IDs, and, in particular, the economic gains from interoperable digital IDs is still limited. Also needed is discussion on policy frameworks conducive to the adoption and use of interoperable digital IDs and sustained user trust.

The purpose of this paper, first in a series of studies on interoperable digital IDs developed by Nextrade Group, is to bridge these gaps by (1) reviewing the models, types and interoperability of digital ID systems around the world; (2) highlighting best practice digital ID models; and (3) discussing policies conducive to the adoption and use of interoperable digital IDs, tailored to countries at different levels of digital readiness.

There are three main conclusions:

- **Digital ID systems are rapidly proliferating around the world, and nearly one-half interoperate with other services.** As of late-2024, per UCL's data, of the 150 digital ID systems around the world, 95 were in a rollout phase, 15 being piloted, and 40 planned.[6] 93 of these, including in 26 countries in Europe and several in Latin America, South and Southeast Asia, and the Middle East, have at least one interoperability capability; 62 countries enable the use of the digital ID infrastructure by at least one external entity and two or more sectoral use cases.

- **Countries around the world are increasingly promoting ID systems' cross-border interoperability, compounding the gains for ID users.** In addition to the EU's continental digital ID wallet, Moldova and Ukraine are aiming at compatibility with the EU's eID wallet; Singapore's Singpass Foreign Account (SFA) enables foreign users to engage with selected government services; and the Mercosur Digital Citizen allows ID holders in Argentina, Brazil, Paraguay, and Uruguay to carry out governmental procedures across the region. A number of digital trade and economy agreements in Asia-Pacific and Africa also promote cross-border interoperability of digital IDs.

- **To diffuse across the society and yield economic gains, interoperable digital IDs need sound design features as well as a robust enabling policy environment.** Data shows that countries that have succeeded at building ID systems that interoperate with various services have designed their ID systems to ensure trustworthy user authentication, privacy protections, and transparency. They have also adopted the G20's recommended pillars of ID systems – legal and regulatory frameworks, financial and digital infrastructures, and e-government systems conducive to the use of digital IDs – and prioritized public-private partnerships to unlock use cases with the private sector.[7] Economies aspiring to build widely used and trusted interoperable digital ID systems should follow these examples.

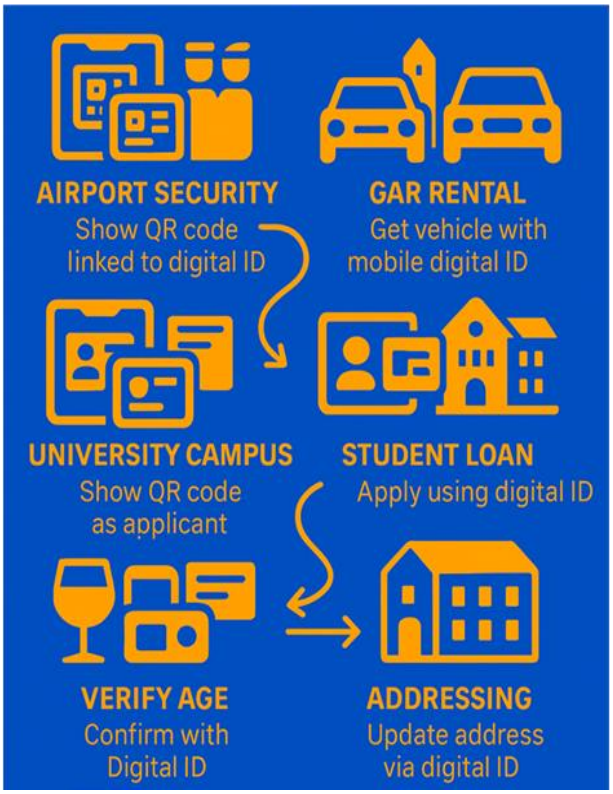
The following section discusses digital ID use cases from around the world. Section three maps digital ID systems around the world and discusses best practice interoperability models. Section four provides policy recommendations on policies conducive to interoperable digital ID systems.

2. Interoperable digital ID as a driver of new value: use cases

Imagine a day visiting a university where you might study for a new Master's degree. At airport security, you show on your phone a QR code connected to your state ID and pass through. At your destination, you get your rental car without stopping for an in-person ID check – the car rental's app already tagged relevant information from your mobile driver's license. Next you go to the university campus where you also do not have to check-in – you simply show another QR code that authenticates you as an applicant.

After touring the campus, you are very excited about the university and decide to apply for a student loan. The application is connected to your ID, and thus no further data entry is needed. You then send your other university transcripts to your new university; these, too, are immediately available with the use of your digital ID. Next, you head for dinner and validate your age for your glass of wine with your ID. You also authenticate your payment credentials using your ID. Then it occurs to you to rent an apartment near the university. All your address information associated with your ID will automatically change across all your apps such as ecommerce marketplaces as well as the postal service.

A day with digital ID: use cases when visiting university for a new Master's degree



Great many use cases like these are emerging in countries with interoperable digital IDs. Some examples include (table 1):

- **Pay in person and remotely.** Digital ID systems can help users access payment systems, superapps, and financing. For example, in Kazakhstan, almost all second-tier banks and 75 payment, microfinance, and other financial service providers are connected to the biometric digital ID system, enabling Kazakhs to easily and remotely identify themselves and make a payment, open a bank account, and order a credit card.[8] In Ethiopia, verifiable credential enabled by the Fayda digital ID wallet, enables bank account opening and receipt of a virtual Visa card for instant payments.[9] Visa is currently leading the work to define how the EU Digital Identity Wallet can be used for payment, authentication for ecommerce and payment initiation for in-person and ecommerce, cards and accounts.[10]

- **Access credit and diverse financial services.** A digital ID can also open access to users to diverse financial services. For example, in 2025, Nigeria's National Identity Management Commission and the Nigeria Education Loan Fund launched biometric-enabled identification cards to facilitate students' access to loans and other financial services.[11] Kazakhstan's ID system enables the users to apply for loans and digital mortgages. Singapore's Financial Data Exchange (SGFINDEX) built on Singapore's digital ID SingPass enables the banks to offer financial and retirement planning solutions to Singaporean residents.[12]

- **Proving identity and age with mobile drivers' licenses**. Brazil and Argentina have pioneered digital (or "mobile") driver's licenses. Brazil made its "Carteira Digital de Transito" mobile app available in 2018, enabling over 50 million Brazilians to prove their identity and age with a QR code on their phone – and receive alerts about vehicle safety and recalls. Argentina's digital driver's license launched in 2019 enables people to drive, obtain car rentals, and produce valid identification. In several U.S. states, governments offer digital driver's licenses that can be used for identity verification on the road, for example at a traffic stop.[13] The U.S. Transportation Security Administration (TSA) also allows the use of these IDs at dozens of airports across U.S. states. Financial institutions can integrate mobile driver's licenses for account opening.[14]

- **Accessing digital health records.** Digital health records make it easier for patients to access their medical history and receive appropriate treatment and can thus improve the efficiency of healthcare delivery. As one example, France's Health Data Hub gathers administrative data across different sources and platforms to improve interoperability.

Table 1 – Interoperable digital identity use cases

Use case	Examples
Payments and ecommerce	• In Kazakhstan, almost all second-tier banks and 75 payment, microfinance and other financial service providers are connected to the digital biometric identification system.
Access to credit and mortgages	• Norway's digital IDs like BankID and are used for credit applications and other financial transactions. • Nigeria uses digital ID to facilitate students' access to educational loans and financial services. • Kazakhstan enables biometric ID holders to apply for a digital mortgage.
Visibility into financial data use	• Singapore's Financial Data Exchange (SGFINDEX) built on digital ID SingPass helps people access and understand how their financial data is used by government agencies and private service providers.
Age confirmation	• Argentina, Brazil, and some U.S states' mobile driver's licenses serve as IDs that can be used to validate a person's age.
Healthcare	• Singaporeans can use digital ID Singpass to access health records and register a birth. • Danish MitID unlocks access to Health information (sundhed.dk).
Voting	• Louisiana allows residents to use their mobile driver's license for voting.
Safety recall notification	• In Brazil, the digital driver's license app provides vehicle owners with notifications about safety recalls. These notifications provide information about the nature of the defect, potential risks if not addressed, and guidance on how to proceed.

Similar use cases for digital IDs can be imagined for various instances that still enable verification with physical documents. For example, ID holders that move homes could readily use their IDs to update their contact information across the postal service, relevant agencies, and service providers.[15] This in turn can fuel ecommerce: using a customer's ID, online businesses can offer near-instant checkouts and reduce cart abandonment.

Interoperable identity beyond borders

Many countries are actively working to make their digital ID systems interoperable at both bilateral and regional levels. The EU's continental digital wallet is a particularly ambitious endeavor (case 1). Other examples include:

- The Singapore-Australia Digital Economy Agreement (SADEA) which includes a Memorandum of Understanding (MoUs) on interoperable digital identity systems.[16] The Singapore-UK and Australia-UK trade agreements; the Digital Economy Partnership Agreement (DEFA) among Chile, New Zealand, and Singapore; and the African Continental Free Trade Agreement's (AfCFTA) Digital Protocol also promote the interoperability of digital ID systems.

- Singapore's Singpass Foreign Account (SFA) enables foreign users to engage with selected government services.[17]

- The Mercosur Digital Citizen launched in 2024 enables digital ID users in Argentina, Brazil, Paraguay, and Uruguay to access public services and processes across the region.[18] For example, Uruguay has already made 40 public sector procedures available for Brazilian ID holders.[19] Bolivia and Chile are also working to integrate into this system.[20]

- Colombia's Cédula Digital enables Colombians to verify their identity when traveling to eight other South American countries, acting as a digital ID for contactless cross-border travel in those countries.[21]

Case 1 – A vision of continental interoperable ID: EU digital identity wallet

Europe is uniquely positioned to set the pace for digital IDs, with a target of 80% eID usage among citizens by 2030. The EU is now pursuing one of the world's most ambitious digital identity initiatives: the EU Digital Identity Wallet, to be rolled out in 2026.[22]

The EU aims to create a unified, cross-border digital identity system accessible through a mobile device. The system is aimed to provide Europeans access to healthcare, education, or employment. A user can with a tap of their EU Digital Identity Wallet verify their identity – and then log onto government portals to accessing benefits or interacting with businesses. The EU is running large scale pilots to test a wide range of use cases as part of the EU Digital Wallet Consortium (EWC), a joint effort to leverage the benefits of the proposed EU digital identity for payments and travel.

The wallet would store multiple documents, such as licenses, ID cards, and certificates. Users can also sign contracts remotely, whether for a rental agreement or a legal transaction. Citizens can choose exactly what information to share in each situation. For instance, when proving age at a bar, a user could simply prove their age without revealing their date of birth, address or full identity.

The eID wallet is constructed through an “Architecture Reference Framework” (ARF) comprised of technical requirements and international standards (ex. W3C, OpenID Foundation, ISO mDL). It is the use of international standards that lays the foundation for interoperability.

Security is a foundational principle of the wallet. Given the increasing sophistication of cyber threats, the EU Digital Identity Wallet employs a layered approach to protection, ensuring that each component—from login to data access—is safeguarded by robust cybersecurity protocols.

One could imagine a range of use cases that already work with paper-based IDs, for example, Finland and Estonia have introduced a European crossborder e-prescription initiative (CBeP) that gives an ID holder access to medical records and services across borders.[23] The system enables healthcare providers to electronically prescribe medications for patients who may reside in or travel to different countries and thus ensure continuity of care.[24] A continental digital ID could readily amplify this and enable remote ordering of medicine regardless of where one is in the EU.

Impacts of digital IDs

Research suggests that digital IDs can dramatically lower the cost of confirming people’s identities.[25] For example, Uganda has saved some $7 million annually by using a national identification database to verify the identities of its civil servants.[26] In Jamaica, the National Identification System (NIDS) has helped reduce the need for Jamaican citizens to register for each governmental benefit program, saving time.[27] In India, the cost of customer identity verification using the Aadhar identity system is only Rs5, compared to prior setting where the cost rose to Rs1,000 (approximately $12). This in turn helped Indian banks open over 450 million new accounts over the past decade. [28]

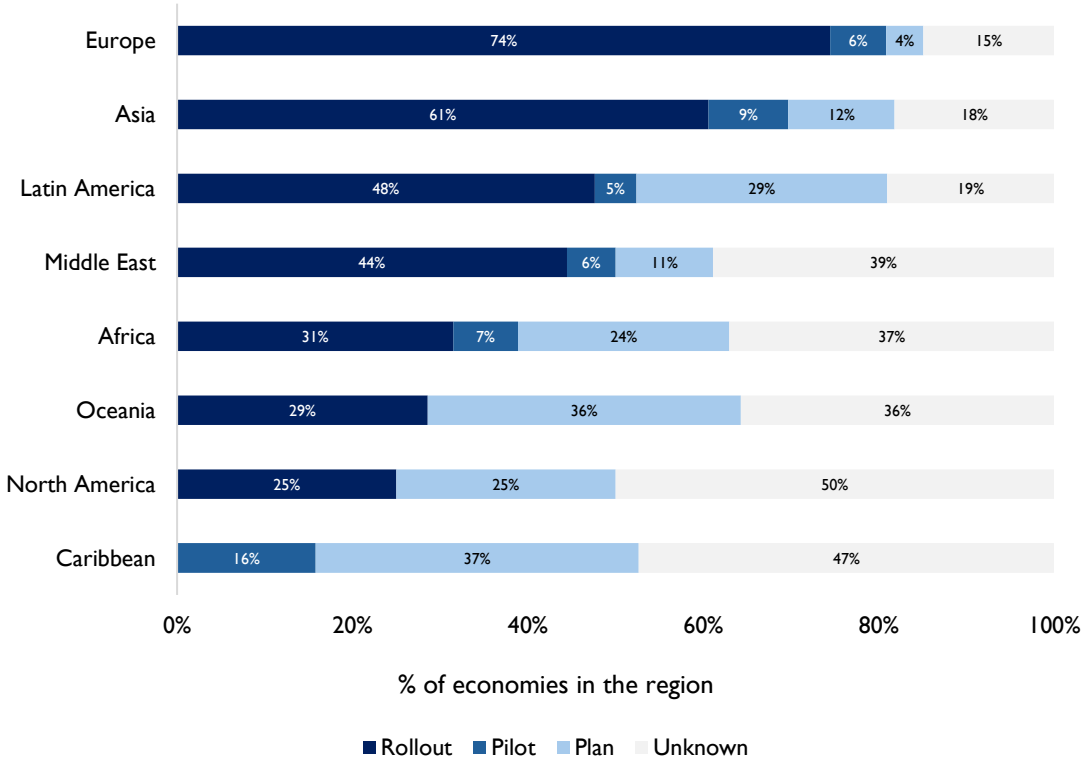
Governments have also created new efficiencies by merging ID with other databases. Malawi has reportedly saved $44 million by merging its voter registration and the national ID system.[29] Pakistan has used its ID program National Database and Registration Authority (NADRA) to identify some 2.4 million individuals who did not yet have national tax numbers, as well as 1.2 million who had tax numbers but were not filing taxes.[30]

A reliable and trusted interoperable digital ID can also be one way for governments to help promote the rise of an ecosystem of financial and other service providers – such as buy-now-pay-later apps, online lenders, telehealth companies, and digital mailboxes – that leverage digital IDs to authenticate potential customers and gain new users.

3. World map of digital ID systems: how interoperable are they?

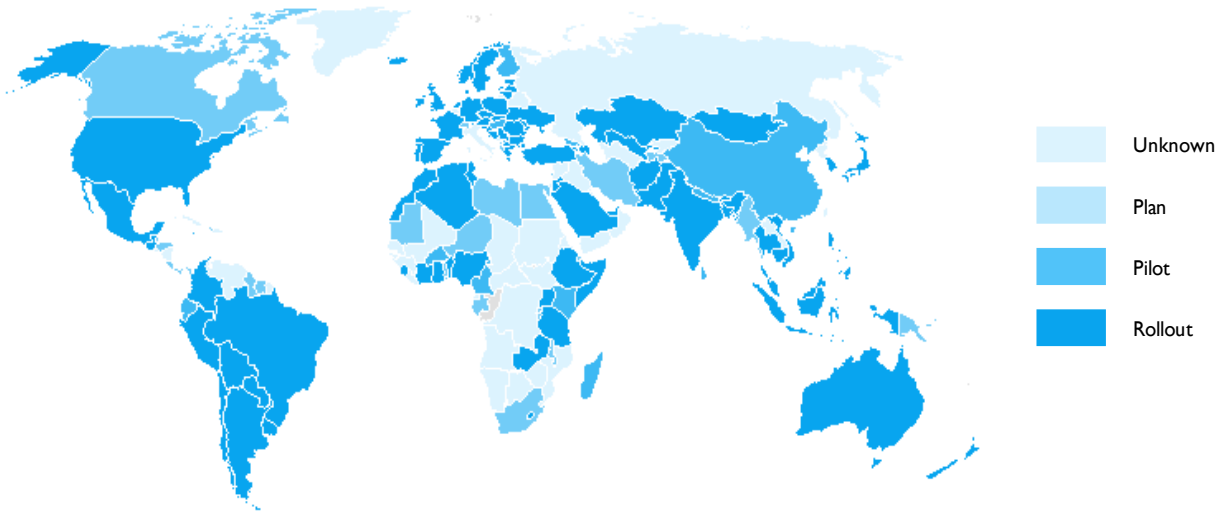
This section develops a global map and typology of digital ID systems. We here leverage the University College London Institute for Innovation and Public Purpose's DPI Mapping project which maps various features of digital IDs around the world. As of late-2024, the project has mapped 210 economies. Of these, 150 had a digital ID system in progress; 95 were in a rollout phase, 15 were being piloted, and 40 planned, with particularly notable rollouts in Europe, Asia, and Latin America (figures 2-3). For 60 economies, no digital ID system was identified.

Figure 2 – Adoption of digital ID systems by stage (% of economies in the region)



Source: Author based on DPI Map (011029024). Institute for Innovation and Public Purpose, UCL.

Figure 3 – Adoption of digital ID systems, by stage and country



Source: Author based on DPI Map (011029024). Institute for Innovation and Public Purpose, UCL.

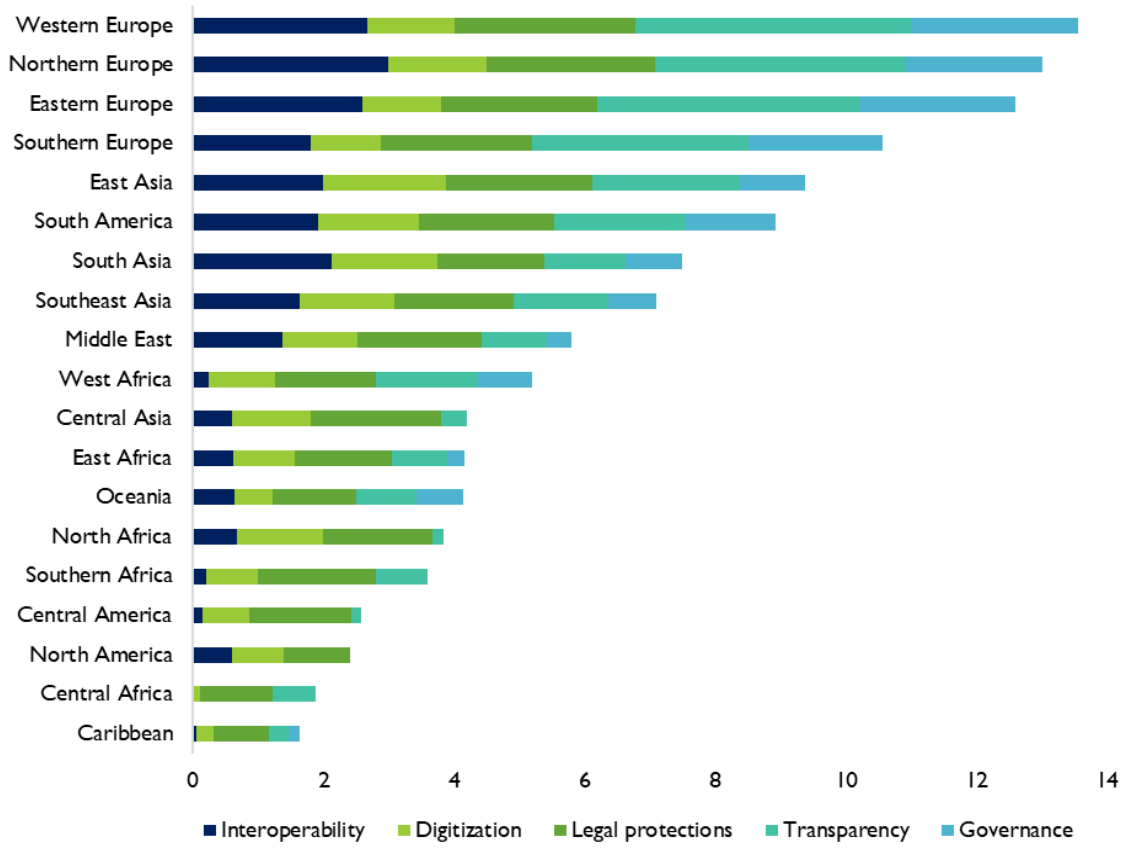
The mapping includes, for each ID system, 18 features that relate to how it is governed, how transparent it is, what personal protections it includes, and which use cases it enables (table 2). The total number of features is highest in Europe, followed by East Asia, South America, and South Asia (figures 4-5).

Table 2 – Features of digital identity systems

Dimensions	Areas scored
Interoperability	Authentication possible through a government portal
	Enables KYC packet collection for service provision
	Use of digital ID infrastructure by at least one external entity
	Two or more sectoral use cases enabled
Digitization	Digital authentication function
	Collects or uses biometric data
Legal protections	Regulation for digital ID
	ID or Civil Registry Act
	National Data Protection Act exists
Transparency	Personal data collection, storage, sharing terms publicly available
	Identity act or secondary policy has procedural rules for digital ID
	Processes to notify individuals about personal data leaks in place
	Data handling terms
	Identity act clarifies relationship with feeder documents
Governance	Court oversight on digital ID system
	Accountability of ID executors to authority
	Legally binding redress mechanism
	Identity act codifies digital ID legal status

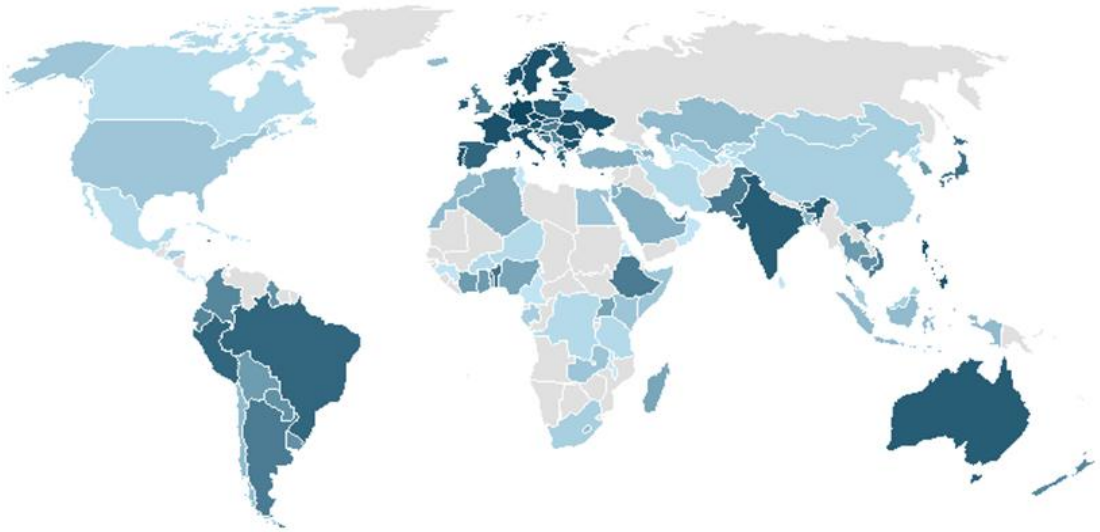
Source: Author's classification into five areas based on the DPI Map (011029024). Institute for Innovation and Public Purpose, UCL.

Figure 4 – Average number of features in digital IDs (includes ID rollouts, plan, pilots) by country in a region (max. 18)



Source: Author's classification based on DPI Map (011029024). Institute for Innovation and Public Purpose, UCL.

Figure 5 – Comprehensiveness of digital ID systems (darker = more features; gray = no digital ID system)



Source: Author's classification based on DPI Map (011029024). Institute for Innovation and Public Purpose, UCL.

Here, four of the 18 features are used as proxies for interoperability of the ID system (how the system enables users to use it in many use cases, and how it enables outside parties to connect to it). These include whether the ID system:

- Enables at least two use cases: whether the digital ID infrastructure is utilized across multiple sectors. This is per the UCL "determined by explicit references to the use of the digital ID system by institutions other than the identity manager or by mentions of use cases beyond citizen identification in official sources."[31]

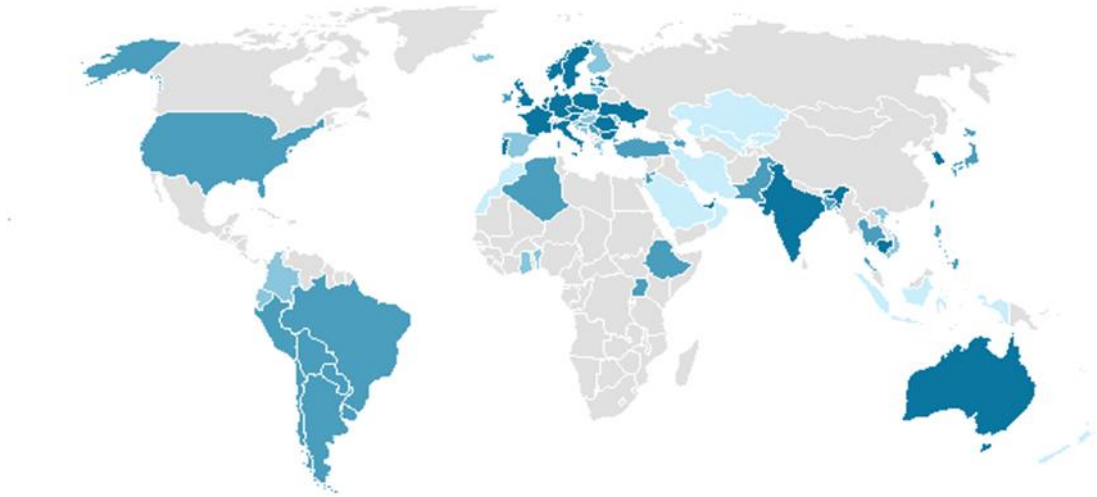
- Can be used by at least one external entity: whether private entities utilize the ID infrastructure for their operations.

- Allows Know Your Customer (KYC) packet collection: whether the ID is verified to assess the person's customer risk. It allows service providers to access profile details from the ID authority's database.

- Makes user authentication possible through government portal: whether the country has a governmental portal that can be used for authentication purposes.

The number of interoperability features is highest in the regions where ID features in general are most numerous. Altogether, 94 economies have at least one interoperability feature (figure 6). As many as 27 economies, 18 of them in Europe, have all four features of an interoperable ID, as do Australia, Bhutan, Cambodia, India, Seychelles, Singapore, South Korea, UAE, and Ukraine. In addition, 49 economies have two or three of the interoperability features. Altogether, 62 economies enable the use of digital ID infrastructure by at least one external entity, and 62 (a largely overlapping set) have enabled two or more sectoral use cases.

Figure 6 – Interoperable digital ID systems (darker blue = more interoperability features; gray = no ID system and/or no interoperability features)



Source: Author's classification based on DPI Map (011029024). Institute for Innovation and Public Purpose, UCL.

Countries that top the list of interoperable ID systems have several use cases for the ID users. For example:

- **SingPass of Singapore.** SingPass, Singapore's national digital identity system owned by the Government Technology Agency of Singapore (GovTech) unlocks a wide range of government and private sector services, such as access to health records, updates to employment details, application of academic grants, exam results, and secure signing of documents. [32] It can also be used for managing profiles of corporate users.[33] SingPass was used for the SafeEntry system for contact tracing during Covid-19: users could check into locations using their phones and thus the system would know who was in touch with whom concurrently.[34] SingPass also serves as a digital identity card, allowing users to verify their identity in a physical setting. For example, users can present their Digital ID card or scan a barcode at government service counters or kiosks.[35]

- **Brazil's Digital Identity Platform (Portal Gov.br),** governed by the Ministry of Management and Innovation in Public Services (MGI), consolidates digital services across federal, state, and municipal levels.[36] The system enables secure, interoperable authentication using Brazil's national identification number and biometric validation, and connects multiple agencies and services under a unified digital ecosystem. Portal gov.br was launched in 2019 as a digital identity hub for 4,000 public services with different verification levels: Bronze, Silver, and Gold, depending on authentication strength; over 162 million Brazilians have registered.[37] The key digital documents available via the portal and the digital driver's license apps include the digital national ID, digital vehicle registration, vaccination records, proof of residency, work and pension records, court and electoral services, and more.

- **Ethiopia's Fayda.** In Ethiopia, digital ID Fayda has helped Ethiopians access the formal economy, open bank accounts, apply for loans, and get a health insurance. It also reportedly enables authentication for healthcare, telecommunications, tax, land registry, pensions, refugee, and banking services.[38] Fayda ID has over 10 million enrollments and forms part of Ethiopia's DPI, together with a digital payments system and an interoperable data exchange platform.[39] In 2025, the National Bank of Ethiopia mandated the use of Fayda for all banking transactions across the country. The government and Ethiopian Airlines are working to enable Fayda as a travel document for local flights.[40]

- **Kazakhstan's ID** journey is based on private sector leadership and public-private partnerships. There are two technologies to identify and authenticate individuals based on biometric digital ID, one for e-government services and another for financial services. Using these systems, Kazakhs can easily authenticate themselves to access e-government services, make a payment, open a bank account, apply for a loan or a digital mortgage, and order a credit card. The government also collaborates with private banks to allow government services to be integrated in banking super apps, for the users of these apps to make payments to the government. Recent legislative changes equating digital documents to physical ones have

enabled citizens to use their digital IDs to access services on banking apps instead of physically traveling to a bank branch.[41]

- **Argentina's Digital Identity System (SID)** developed by the Ministry of the Interior of the Nation (formerly, Ministry of the Interior) and the Secretariat of Public Innovation enables authentication through the agencies responsible for citizen identification data, such as AFIP, the tax identification number (CUIT) provider. The Mi Argentina app holds digital driver's licenses, vaccination records, certificate of disabilities, family registry, and more.[42] On its first day, Mi Argentina received an average of 200,000 visits per minute; within one month the app had registered 1 million new users.[43] In 2024, the government enabled remote authentication using facial biometrics.[44] Also the city government of Buenos Aires is launching a digital ID service that stores marriage and death certificates on blockchain.[45] The system enables validation of proof of income, certificates of academic attendance, and benefit claim documents via the QuarkID wallet.[46]

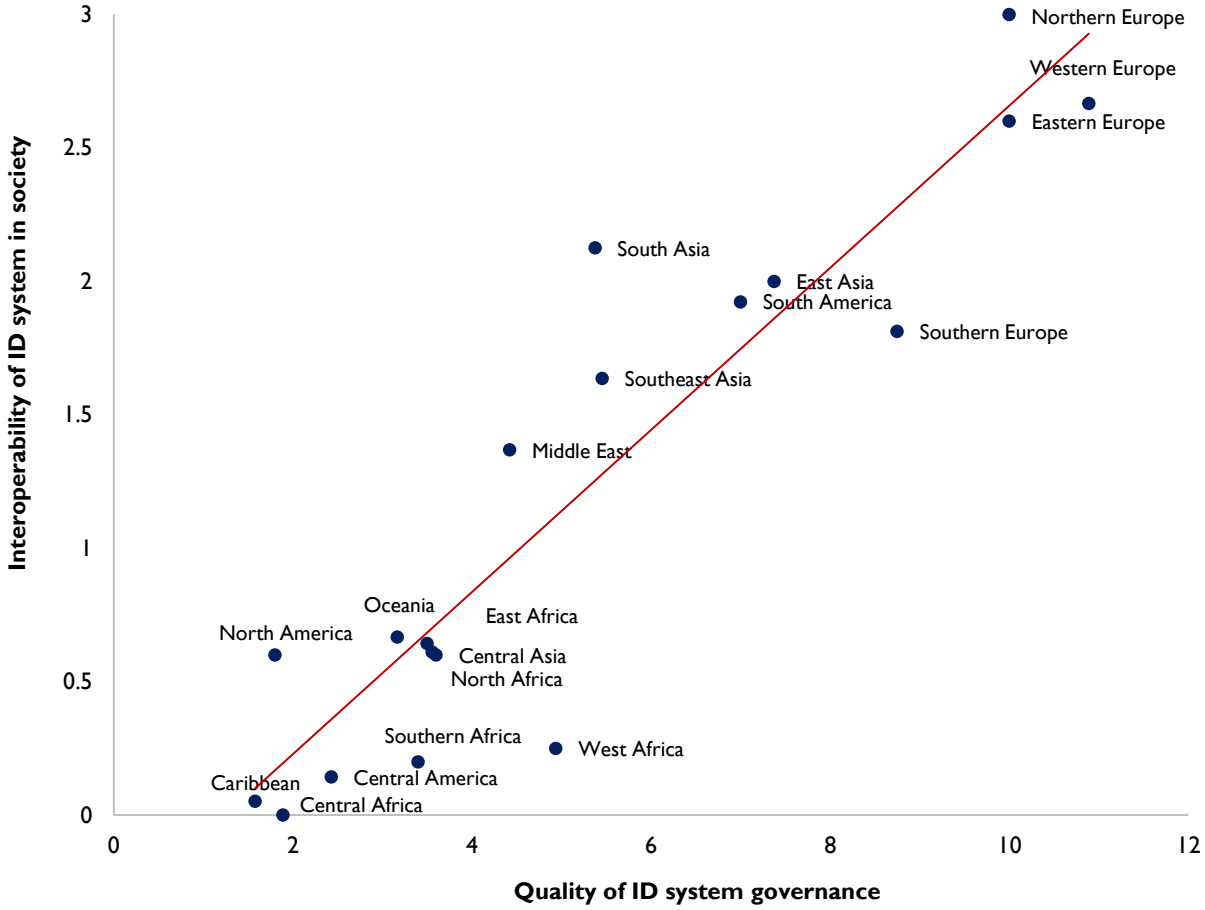
- **Sweden's BankID**. The government is not necessarily the only instance that can build a digital ID. Digital IDs created by banks in Nordic countries have become widely used across use cases. In Sweden, the BankID created in 2003 by seven major banks has been approved as an official ID by the government, and is used by 94 percent of Swedes with smartphones.[47] It enables users to access banking, telecommunications, and government services, and to authorize transactions, sign documents, and access a wide range of services. The BankID has also been integrated into the highly popular real-time payment system Swish, also created by Swedish banks. A 2022 BankID update enabled businesses to verify customers and prevent fraud.[48] In 2023, BankID expanded to include a digital ID card that connects digital and physical identity verification in offline settings, enabling users to confirm their identity in person using a scannable QR-code linked to their BankID account, for example upon visiting a government agency.[49]

4. Considerations for policymakers to promote interoperable digital IDs

For interoperable digital IDs to be adopted and used widely, there need to be solid foundations – robust ID design features and an enabling policy and regulatory environment that secures users' privacy, cybersecurity, user consent and control over their data, and rights across the various use cases. There are instances where the aspiration for interoperable systems has been undermined by inadequate cybersecurity and data privacy protections. For example, India's Aadhaar suffered a major data breach in 2023, leaving 815 million Indians' data exposed.[50]

Empirically, interoperable digital ID systems tend to also have other key features of good ID systems: digitization, legal protections, transparency, governance (figure 7).

Figure 7 – Interoperability and quality of digital ID systems



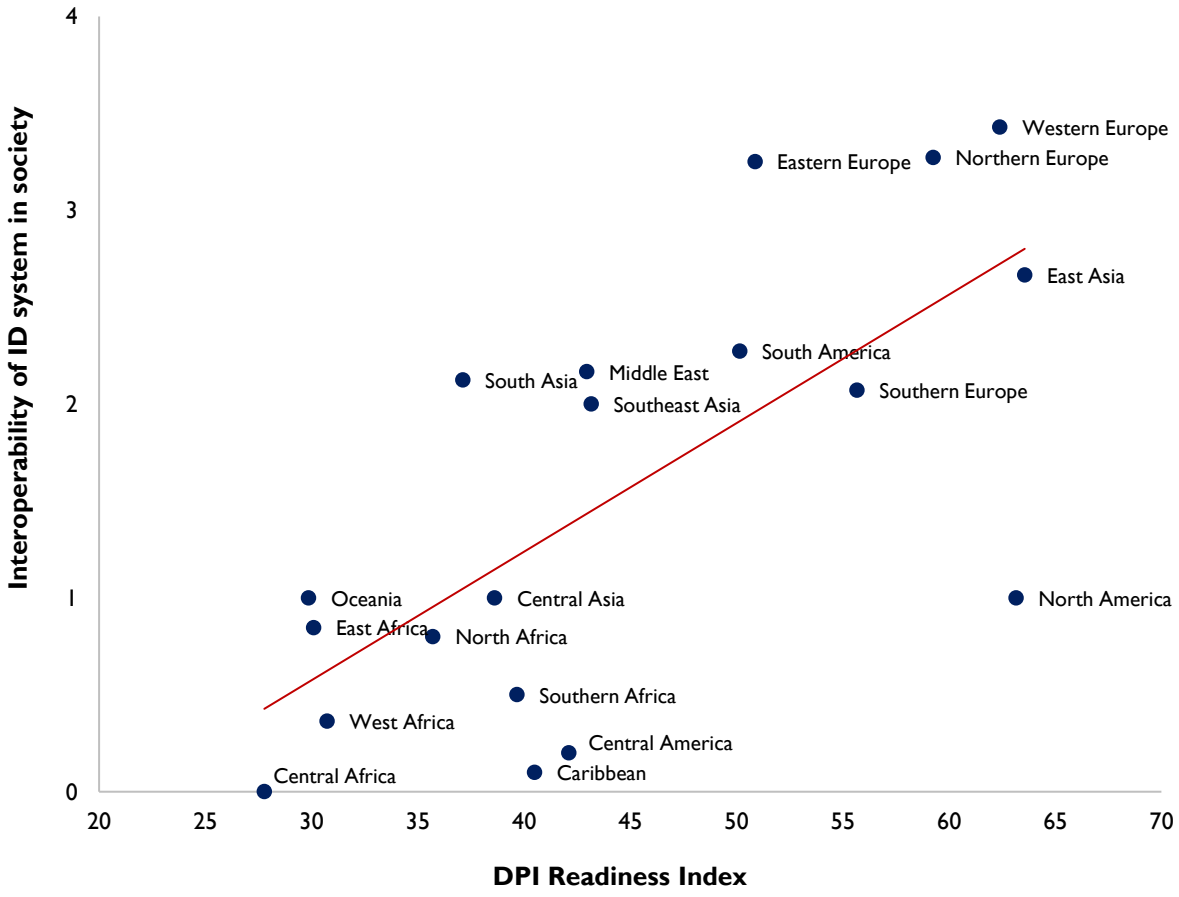
Source: Nextrade on the basis of DPI Map (011029024). Institute for Innovation and Public Purpose, UCL. Quality is here all 14 non-interoperability variables.

In addition, economies aspiring to build a digital ID with multiple use cases need a robust enabling environment, such as infrastructure and widespread internet connectivity, government capacity to adopt and operationalize ID systems, and enabling legal and regulatory frameworks such as data privacy and cybersecurity laws. Indeed, the G20's position paper on digital public infrastructure, like ID systems, emphasizes the need for:[51]

- Enabling financial and digital infrastructures, such as mobile penetration and broadband connectivity;
- Ancillary government support systems, such as G2P digital payments; and
- Conducive legal and regulatory frameworks, such as data protection and privacy laws.

In 2024, Nextrade created a DPI readiness index with these three elements (that in turn were based on 15 variables in appendix 1), finding that North America as the most DPI-ready region, followed by Europe and Central Asia and Latin America and the Caribbean, while Sub-Saharan Africa lags behind (figure 8).

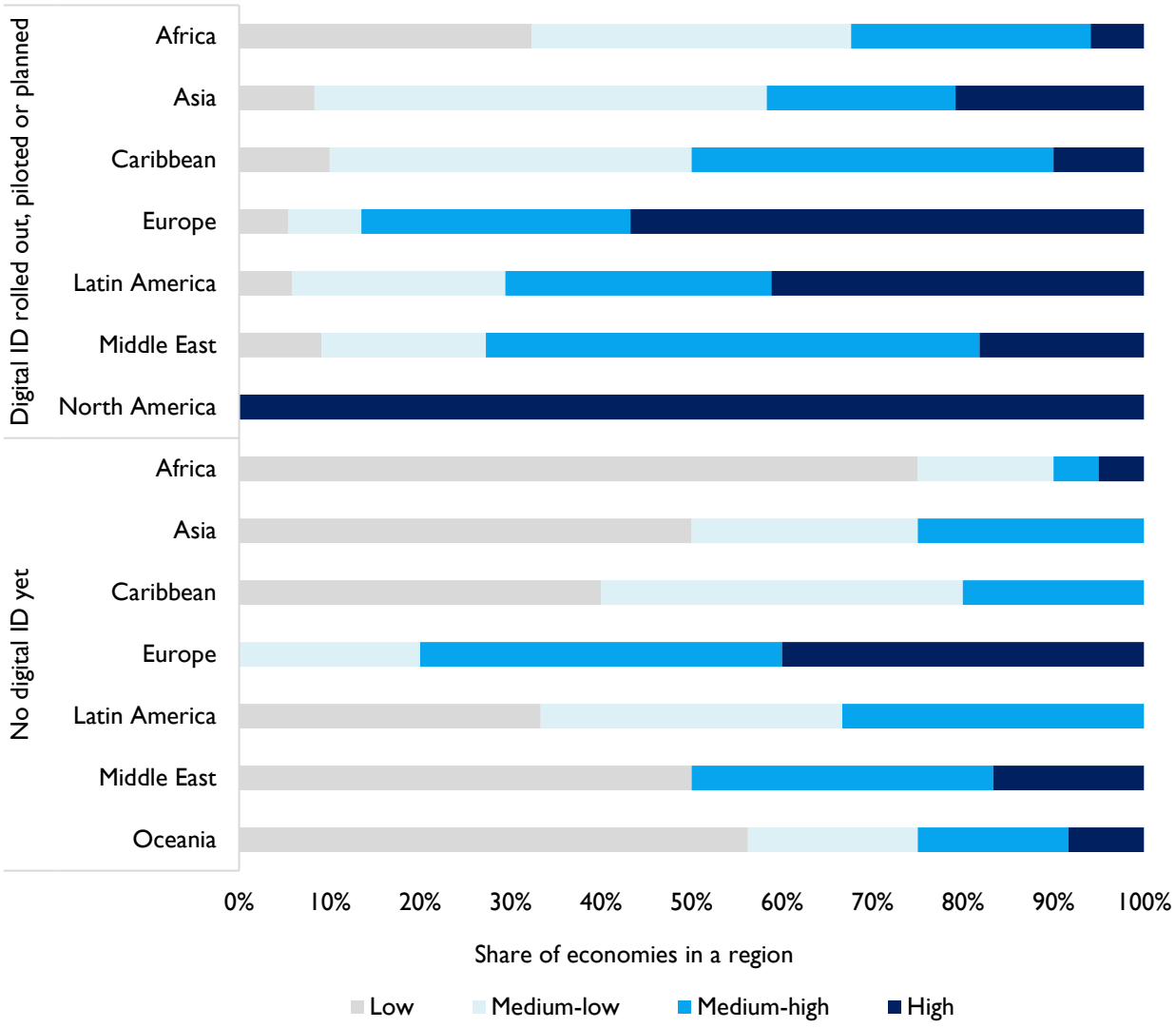
Figure 8 – Interoperability of ID systems and DPI readiness of the enabling policy environment



Source: Nextrade Group's DPI readiness index; interoperability per the DPI Map (011029024). Institute for Innovation and Public Purpose, UCL.

Using this index and grouping economies into two sets – those that have planned, piloted or rolled out digital IDs and those that have not – shows that the readiness for adopting a digital ID is medium-high or high in more than half of countries that have an ID project in Europe, Latin America, Middle East and North America, but still limited in the economies that do not have a digital ID planned (figure 9).

Figure 9 – Readiness for digital ID (low to high) among economies that have planned, piloted or rolled out digital IDs and those that have not, by region



Source: Nextrade Group DPI Readiness Index (2024) and DPI Map (011029024). Institute for Innovation and Public Purpose, UCL.

5. Conclusion

Digital ID allows personal data to be securely shared with anyone, anywhere, and at any time. It enables individuals to hold verifiable digital versions of their personal information issued by trusted organizations, and choose what data to share and when to share it.

Interoperable digital IDs that enable many use cases compound the gains from an ID system to their users, governments, and businesses. They empower users to use two or more services easily; reduce repetitive and error-prone manual work across the ecosystem; help promote people's participation in the formal economy; and streamline processes for small businesses that transact with individuals.

This paper has reviewed many use cases for such ID, such as age verification, access to financial services, the ability to pay across the economy and borders, and access to medical records and certificates.

Interoperable digital ID systems have proliferated especially in Europe, East and South Asia, and South America. These ID systems typically have many positive features, such as redress mechanisms and privacy protections. Economies with interoperable IDs have also put in place data privacy, consumer protection, and cybersecurity laws; promoted digitization and digital literacy; improved government services; and, importantly, enabled private sector providers to offer services to the ID holders through public-private partnerships.

The many opportunities opened by interoperable IDs to reach and authenticate users at scale can also help catalyze a robust ecosystem of fintechs and other digital services.

Widespread use of digital payments is a powerful catalyst for an ID system that is widely trusted and used in a society and that translates into tangible economic gains. With every digital transaction, users gain affinity and trust in digital services and online authentication. As such, countries working toward digital IDs should promote digital payments. Such economies as Singapore, Sweden, and Kazakhstan have shown how IDs enable payments and payments promote the use of IDs.

Future papers in this series will examine more closely the adoption of digital ID systems, the operationalization of diverse interoperability use cases, and the effects of interoperable digital IDs on digital services ecosystems.

Appendix 1

Nextrade's 2024 DPI Readiness Index brings together the following elements (Figure 1-1).[52]

Enabling financial and digital infrastructures:

- **Internet connectivity:** Provision of high-speed internet through broadband, for example through fiber-optic cables, wireless towers, and satellite systems and a telecom infrastructure facilitate the uptake of DPIs. We use here data from the United Nations on internet connectivity through the Online Service Index in 2022 , which measures a country's level of sophistication in online presence.[53]

- **Telecommunications network**. UN on Telecommunications Infrastructure Index in 2022. The Telecommunication Infrastructure Index is a weighted average of six primary infrastructure-related indicators that define a country's ICT infrastructure capacity.[54]

- **Access to devices:** Access to devices, most fundamentally phones and smartphones, is key to full benefits from DPIs. Access is here proxied with data from Newzoo in 2019 on smartphone users.[55]

- **Cost of devices:** Cost of devices also shapes access; we use here smartphone and feature phone cost data for 2022 from the Alliance for Affordable Internet.[56]

- **Fintech ecosystem:** A robust fintech ecosystem enables the development of the technology that underlies and complements DPI. We use the 2021 Global Fintech Rankings Index from Findexable.[57]

- **Digital skills and literacy:** Promoting digital skills and literacy is necessary to enable citizens to effectively use digital services. Digital literacy is here proxied by the World Bank's Human Capital Index from 2020.[58]

Ancillary government support systems, such as G2P digital payments

- **E-participation:** Measures the use of information and communication technologies (ICTs) that allow citizens to participation in government-related processes. The E-participation Index is supplementary to the United Nations E-Government Survey and acts as a framework composed of three core components: e-information, e-consultation, and e-decision-making.[59]

- **E-Government:** The E-Government Development Index is a composite measure of three important dimensions of e-government: provision of online services, telecommunication connectivity, and human capacity. It seeks to reflect how a country is using information technologies to promote access and inclusion of its people. This data is from the UN 2022 E-Government Development Index.[60]

- **Government effectiveness:** Captures the perceptions of the quality of public and civil services, its independence from political pressures, and the government's commitment to high quality policies and implementation, essential for DPI. This data is from World Bank Worldwide Governance Indicators.[61]

- **Taxes as share of GDP:** Collecting taxes is a fundamental way for governments to generate public revenues that make it possible to finance investments in infrastructure such as DPI. This data comes from World Bank Indicators.[62]

- **Public-private partnerships:** Readiness to develop public-private partnership should aide economies in creating DPIs that promote rather than crowding out DPIs. We use here as a proxy for public-private partnership readiness by the Infrascope Index Ranking that measures the enabling environment for public-private partnerships in infrastructure development and consists of five components: enabling laws and regulations, the institutional framework, operation maturity, investment and business climate, and financing facilities for infrastructure projects.[63]

Conducive legal and regulatory frameworks, such as data protection and privacy laws

- **Privacy regulations:** We leverage Nextrade's mapping of data privacy rules around the world. Countries with complete legislation are scored as 1, countries that do not have a data privacy law are scored as 0.[64]

- **Cybersecurity capabilities**: DPIs should and do include cybersecurity technologies and measures to safeguard sensitive information, protect against cyber threats, and ensure data privacy. Estonia's National Cybersecurity Index provide multiple data points on the characteristics of cybersecurity readiness for 2021, which also correlate heavily with legal frameworks for cybersecurity.

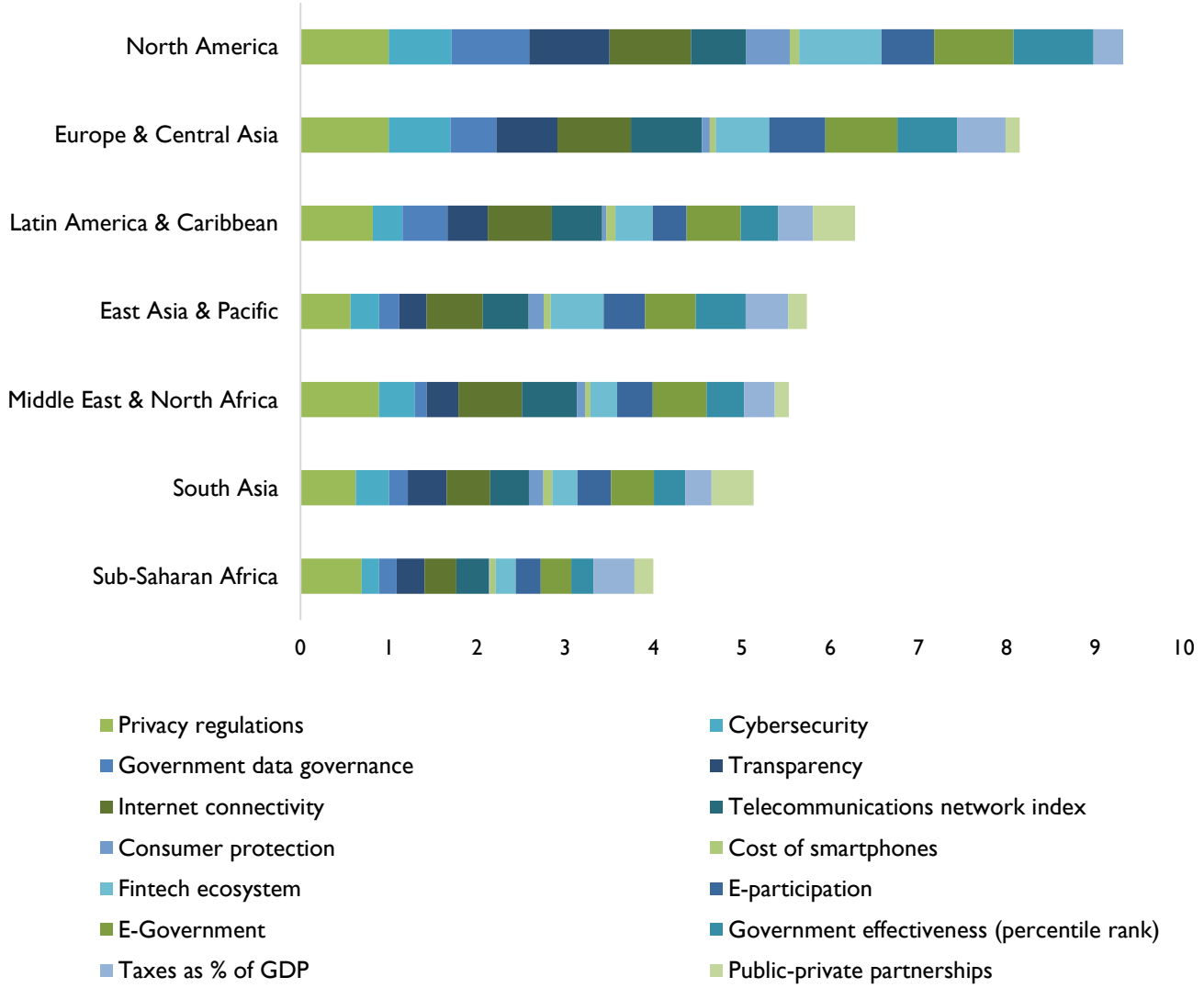
- **Government data governance:** Data governance frameworks to ensure the security, privacy, and ethical use of data. This was found through the World Justice Project's Rule of Law Index. Government data governance is based on component 4.6: Freedom from arbitrary interference with privacy is effectively guaranteed, where

- police or government officials conduct physical searches without warrants or intercept electronic communications of private individuals without judicial authorization.[65]

- **Transparency:** Measures the availability of free and accessible information on public websites by showing what governments commit to sharing, and what they actually share. This data comes from CorruptionRisk.org and is updated as of June 2023.[66]

Normalizing each variable to a 0-1 continuum and averaging the data by the number of countries yields an index per figure 1-1.

Figure 1-1 – DPI Readiness Index, by specific elements and region (max. 14)



Source: Nextrade Group, 2024.

References

[1] https://www.linkedin.com/pulse/new-open-loop-digital-identity-ecosystem-now-inevitable-jamie-smith/

[2] https://id4d.worldbank.org/global-dataset

[3] https://www.imf.org/external/pubs/ft/fandd/2021/07/india-stack-financial-access-and-digital-inclusion.htm

[4] https://e-estonia.com/solutions/estonian-e-identity/id-card/

[5] Ukraine's Diia: A Digital Lifeline in Times of Crisis | Blog | CGAP

[6] https://dpimap.org

[7] https://www.g20.org/content/dam/gtwenty/gtwenty_new/document/G20_POLICY_RECOMMENDATIONS.pdf

[8] https://www.csis.org/analysis/building-dpi-lessons-learned-kazakhstan

[9] See, for example, https://www.biometricupdate.com/202505/ethiopia-unveils-faydapass-digital-wallet-to-boost-financial-inclusion

[10] https://corporate.visa.com/content/dam/VCOM/corporate/audiences/documents/visa-B2B-digital-id-whitepaper.pdf
[11] https://idtechwire.com/nigeria-launches-biometric-student-id-cards-to-enable-education-loans/

[12] https://www.allianceforetradedevelopment.org/_files/ugd/478c1a_704a4b1e1ab34ddabb28f4e69d7c5786.pdf

[13] https://idscan.net/mobile-drivers-licenses-mdl-state-adoption/?srsltid=AfmBOooz-9fUtNXY2Q1IulzNJUxY86pm5l4-MNfgD_0HY349IYMSXi8b

[14] See, for example, https://www.nist.gov/blogs/cybersecurity-insights/check-your-wallet-how-mobile-drivers-licenses-are-changing-online and https://www.biometricupdate.com/202502/mobile-drivers-licenses-on-the-cusp-of-major-paradigm-shift

[15] https://www.linkedin.com/pulse/new-open-loop-digital-identity-ecosystem-now-inevitable-jamie-smith/

[16] https://accesspartnership.com/digital-identities-and-cross-border-interoperability/

[17] https://www.iras.gov.sg/digital-services/others/singpass-foreign-user-account-(sfa)-for-foreign-individuals

[18] Presentan 'Ciudadano Digital Mercosur', iniciativa para mejorar la prestación de servicios y simplificar trámites | U Yotoch Chanboox Boox

[19] Digital identification, learning from traditional identifications (part 2: vision for the future) | Inter-American Center of Tax Administrations

[20] Presentan 'Ciudadano Digital Mercosur', iniciativa para mejorar la prestación de servicios y simplificar trámites | U Yotoch Chanboox Boox

[21] https://www.nfcw.com/2022/08/10/378486/colombia-to-let-citizens-use-digital-id-for-contactless-cross-border-travel-in-south-america/

[22] For a discussion, see https://corporate.visa.com/content/dam/VCOM/corporate/audiences/documents/visa-B2B-digital-id-whitepaper.pdf

[23] https://iris.who.int/bitstream/handle/10665/332593/Eurohealth-25-2-18-20-eng.pdf

[24]https://www.sciencedirect.com/science/article/abs/pii/S1551741124004091#:~:text=The%20European%20cross%2Dborder%20electronic,its%20benefits%20and%20potential%20shortcomings

[25] https://www.imf.org/external/pubs/ft/fandd/2021/07/india-stack-financial-access-and-digital-inclusion.htm

[26] https://blogs.worldbank.org/en/digital-development/the-importance-of-id-access-in-three-charts--insights-from-sub-s

[27] https://opm.gov.jm/portfolios/national-identification-system

[28] https://www.imf.org/en/Publications/WP/Issues/2023/03/31/Stacking-up-the-Benefits-Lessons-from-Indias-Digital-Journey-531692

[29] https://documents1.worldbank.org/curated/en/745871522848339938/Public-Sector-Savings-and-Revenue-from-Identification-Systems-Opportunities-and-Constraints.pdf

[30] https://documents1.worldbank.org/curated/en/745871522848339938/Public-Sector-Savings-and-Revenue-from-Identification-Systems-Opportunities-and-Constraints.pdf

[31] https://docs.google.com/spreadsheets/d/1JbpmZ1ap235wVCTcnA1dE5ghCWEzdFJXxyZz1FTRupk/edit?gid=0#gid=0

[32] https://www.m2sys.com/blog/guest-blog-posts/7-things-you-can-do-with-singpass-singapores-trusted-digital-id/#:~:text=SingPass%20is%20also%20commonly%20used,and%20accessing%20government%20job%20portals

[33] https://www.tech.gov.sg/products-and-services/for-citizens/digital-services/singpass/

[34] https://www.gobusiness.gov.sg/dashboard-faqs/account-access/foreign-users-individual#:~:text=The%20Singpass%20Foreign%20Account%20(SFA,from%20the%20date%20of%20issuance

[35] https://www.smartnation.gov.sg/media-hub/press-releases/singpass-factsheet-02032022/#:~:text=Besides%20facilitating%20digital%20transactions%2C%20the,Digital%20IC%20into%20their%20systems.

[36] See timeline at https://www.cambridge.org/core/journals/data-and-policy/article/digitization-of-the-brazilian-national-identity-system-a-descriptive-and-qualitative-analysis-of-its-information-architecture/9383EF02D1892A5581D93F40348ABD16

[37] Brasil y Uruguay avanzan en acuerdos transfronterizos, en el camino a lograr un Ciudadano Digital Mercosur – TeleSemana.com

[38] Introduction to Fayda- Jan 2024.pptx - Google Slides

[39] Introduction to Fayda- Jan 2024.pptx - Google Slides

[40] Ethiopia mandates the use of Fayda ID for all banking transactions - Finance in Africa

[41] https://astanatimes.com/2023/03/kazakh-citizens-can-use-digital-id-at-polling-stations-in-upcoming-parliamentary-election/

[42] https://www.facebook.com/story.php?story_fbid=1481572262304377&id=517154178746195&m_entstream_source=permalink&_rdr

[43] https://beeckcenter.georgetown.edu/wp-content/uploads/2020/04/V4-Margaritas-Case-Study.pdf

[44] https://www.tuid.ar/kba-dinamico/la-revolucion-de-la-identidad-digital-nueva-normativa-para-la-firma-digital-en-argentina

[45] City of Buenos Aires launching blockchain-based digital ID service - AiCoin

[46] City of Buenos Aires launching blockchain-based digital ID service - AiCoin

[47] https://en.wikipedia.org/wiki/BankID_(Sweden)#:~:text=BankID%20is%20an%20electronic%20identification,number%20can%20acquire%20Bank%2Did

[48] https://platform.bankid.com/news-and-insights/news/bankid-launches-new-anti-fraud-feature-for-enhanced-security

[49] https://www.finextra.com/newsarticle/42228/swedens-bankid-launches-digital-identity-card

[50] https://www.livemint.com/news/india/aadhaar-data-leak-massive-data-breach-exposes-815-million-indians-personal-information-on-dark-web-details-here-11698712793223.html

[51] https://www.g20.org/content/dam/gtwenty/gtwenty_new/document/G20_POLICY_RECOMMENDATIONS.pdf

[52] https://www.nextradegroupllc.com/_files/ugd/478c1a_d24ece1c299a487e959184c6002463f7.pdf

[53] https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government-Development-Index#:~:text=Mathematically%2C%20the%20EGDI%20is%20a,TII)%2C%20and%20(3)

[54] https://publicadministration.un.org/egovkb/Data-Center

[55] How Many People Have Smartphones Worldwide (Sep 2023) (bankmycell.com)

[56] https://docs.google.com/spreadsheets/d/1SBlHrjDu4Nq1Pv7pyCCYIpQWAjNkPQtgtdbCa1tbA5A/edit#gid=1471166238

[57] https://findexable.com/wp-content/uploads/2021/06/Global-Fintech-Rankings-2021-v1.2_30_June.pdf

[58] https://data.worldbank.org/indicator/HD.HCI.OVRL

[59] https://publicadministration.un.org/egovkb/en-us/About/Overview/E-Participation-Index

[60] https://publicadministration.un.org/egovkb/en-us/Data-Center

[61] https://www.worldbank.org/en/publication/worldwide-governance-indicators

[62] https://data.worldbank.org/indicator/GC.TAX.TOTL.GD.ZS

[63] https://infrascope.eiu.com/

[64] https://unctad.org/page/data-protection-and-privacy-legislation-worldwide

[65] https://worldjusticeproject.org/rule-of-law-index/factors/2022/Fundamental%20Rights/

[66] https://corruptionrisk.org/transparency-ranking/