

Estonia – the Digital Republic Secured by Blockchain

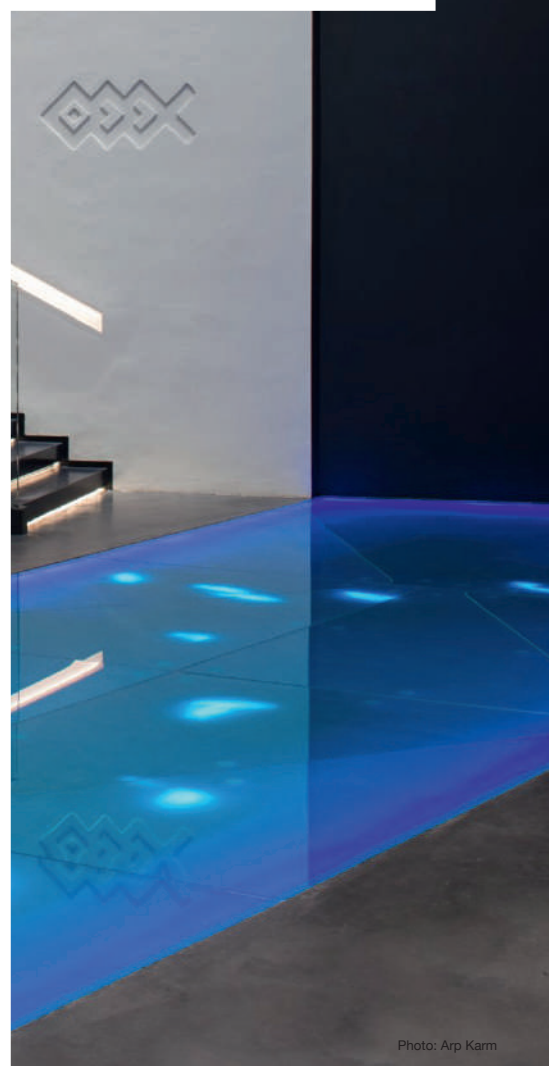


Photo: Arp Karm



“The most advanced digital society in the world.”

Wired

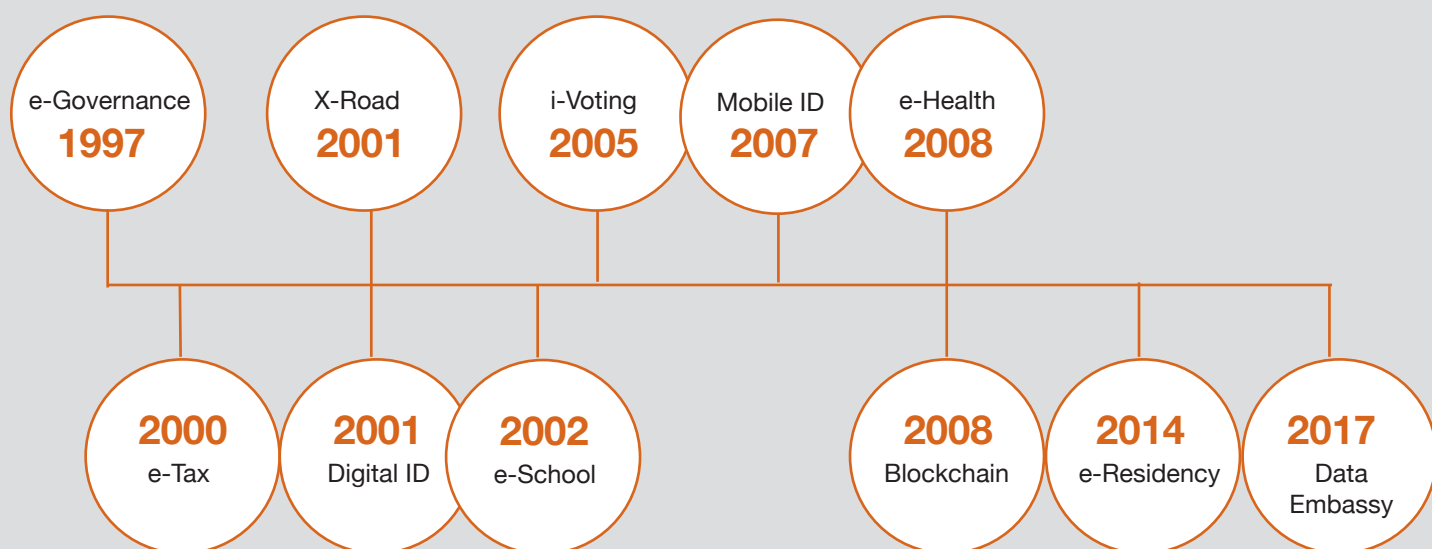
“The World’s Most Digital Country.”

Forbes

“I should have called the Estonians when we were setting up our health care website.”

Barack Obama

In a connected world, how the citizen wants to deal with government and the public sector is changing, driven by the possibilities opened up by new technology.



For government and the public sector, the opportunity is not only to deliver services better and faster and improving outcomes but also to **reduce costs**.

Estonia began building its digital society through an e-governance system to provide public services online in 1997.

As of today, **99%**

of public services are available to citizens as e-services.

- Today virtually all state-related operations – except marriage, divorce, and real estate transactions – can be carried out digitally.
- Filing a tax return takes less than five minutes, public voting occurs online, and all patients have electronic medical records. It is easy to establish a company online and sign documents digitally.
- **Officials report that Estonia saves over 1400 years of working time and 2% of GDP annually through its digitised public services.**

1. Digital ID



During the past 15 years over 400 million digital signatures have been given in Estonia – more than in all the other EU member states combined.

Every Estonian, irrespective of their location, has a state-issued digital identity.

Estonia has the most highly-developed national ID card system in the world. Much more than a legal photo ID, the mandatory national card also provides digital access to all of Estonia's e-services.

According to legislation, **a qualified electronic signature is equal to a hand-written signature, stamp or seal** and all Estonian authorities are obliged to accept electronic signatures.

Digital ID benefits

- legal travel ID for Estonian citizens travelling within the EU
- national health insurance card
- proof of identification when logging into bank accounts
- for digital signatures
- for i-Voting
- to check medical records
- to use e-Prescriptions

Having the digital ID infrastructure alone is not enough. There have to be enough services to support it and getting the private sector onboard is of crucial importance. In Estonia, people first saw the value of digital ID because they could use it to access online banking. Meanwhile, banks did not have to develop their e-ID solutions and therefore saved significantly on cost.

2. X-Road

Is the backbone of e-Estonia. According to the World Bank Development Report, X-Road is what allowed Estonia to become a truly digital society. It is a technological and organisational environment enabling secure Internet-based data exchange between information systems. X-Road is based on an interoperable ecosystem.

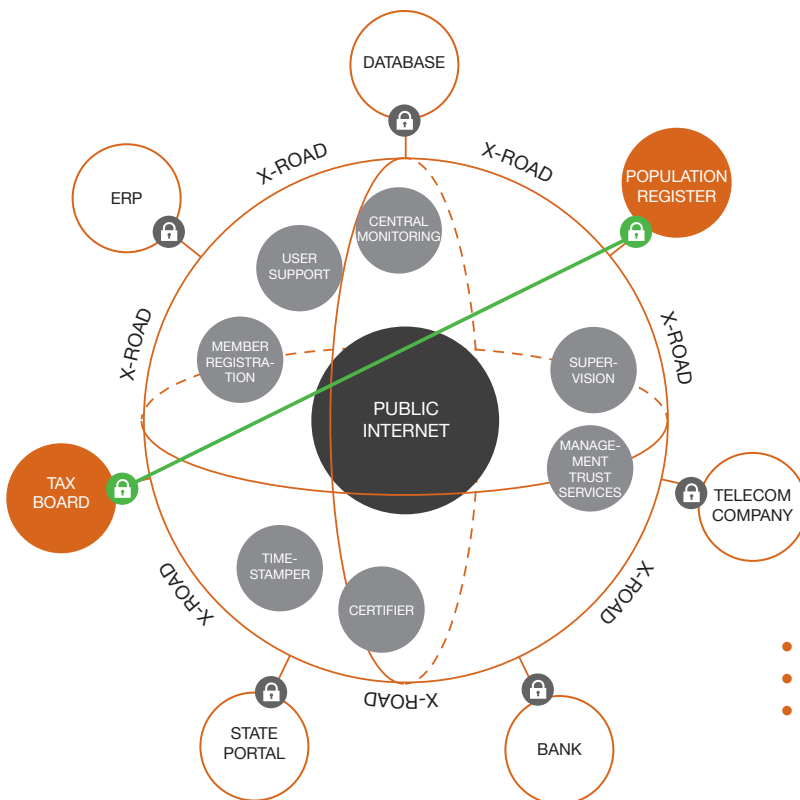
One example is a solution by the police for checking driving licenses.

A driver no longer has to carry a driver's license with them, as a police officer can, via X-Road, make an inquiry from the database of the Road Administration whether that person has a valid license. The driver needs to present his/her personal identification document.

- **X-Road is also implemented in Finland, Azerbaijan, Namibia and Faroe Islands.**
- **X-Road allows data to be automatically exchanged between countries. Since 2017, automatic data exchange capability has been established between Estonia and Finland.**

1300+ interfaced information systems

2700+ services



Sensitive data can also be exchanged. We follow the principle that the owner controls the data throughout the whole process, and the X-Road technology only offers a secure data exchange.

- **Decentralised Architecture**
- **No Single Point of Failure**
- **Independence of platform and architecture** – X-Road enables the information systems of X-Road members on any software platform
- **Multilateralism** – X-Road members can request access to any data services provided through X-Road.
- Availability and standardisation – for managing and developing X-Road, international standards and protocols are used where possible.
- **Security** – exchanging data through X-Road does not affect the integrity, availability or confidentiality of the data.

3. e-Residency



Photo: Renee Altrov

The reason why Estonia created the concept of e-Residency was to give people all around the world access to the online government services previously only available for the Estonian residents.

e-Residency is not a travel document, citizenship or an actual residency but a transnational digital identity that can provide anyone, anywhere with the opportunity to succeed as an entrepreneur. Like citizens and residents of Estonia, e-residents receive a government-issued digital ID and full access to Estonia's public e-services.

Estonia believes that countries will one day compete for e-residents based on the quality of their public e-services and their business environment.

e-Residents can:

- Establish and manage an Estonian company online from anywhere in the world
- Apply for a business bank account and conduct secure e-banking
- Access international payment service providers
- Digitally sign and transmit documents
- Declare Estonian taxes online

Estonia has

50,000

e-residents from more than

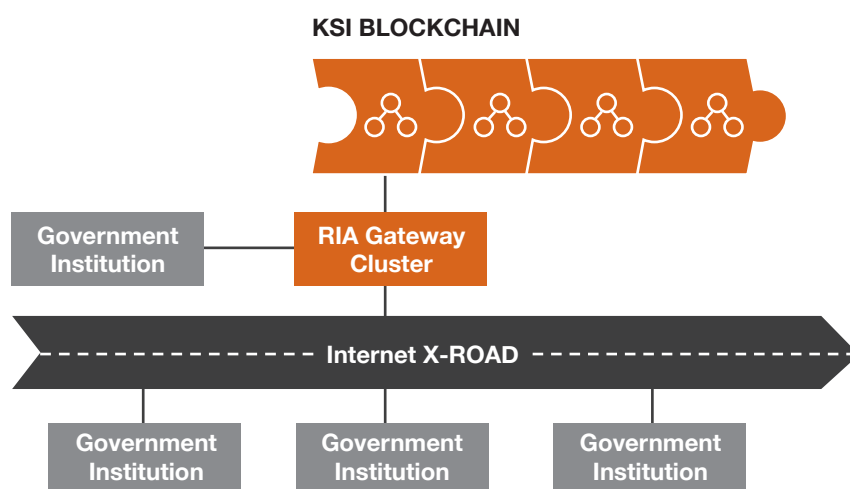
165

countries that have established

5000

companies.

4. Blockchain Pioneers



- The ability to 100% trust government data in any situation is one of the foundational capabilities for any Nation State.
- The ability to enforce the integrity of government data provides the capability to effectively mitigate insider threat focused at manipulating with and abusing the stored data.
- The ability to verify the integrity of government data independently of its home database, in real time, enables data interoperability between systems and across boundaries.

Selected State Registries backed by KSI Blockchain:

	Healthcare Registry
	Property Registry
	Business Registry
	Succession Registry
	Digital Court System
	State Gazette

Estonia was the first Nation-State in the world to deploy blockchain technology in production systems – in 2012 with the Succession Registry kept by the Ministry of Justice.

The technology chosen for Estonian systems is KSI Blockchain, also used by NATO and the U.S. Department of Defense.

Data never leaves the system; only hash is sent to blockchain service. As no data is stored on the KSI Blockchain, it can scale to provide immutability for petabytes of data, every second. The lesson learned from Estonia is that speed is essential for citizen experience.

Being a digital society means exposure to cyber threats. With substantial investments in cybersecurity infrastructure, Estonia has developed extensive expertise in this area, becoming one of the most recognised and valued international cybersecurity experts.

Today it takes seven months on average to discover data breaches – with Estonian KSI Blockchain technology these breaches can be detected instantly.

Estonia is home to the:

- NATO Cooperative Cyber Defense Center of Excellence
- EU IT Agency (eu-LISA)

5. Data Embassy

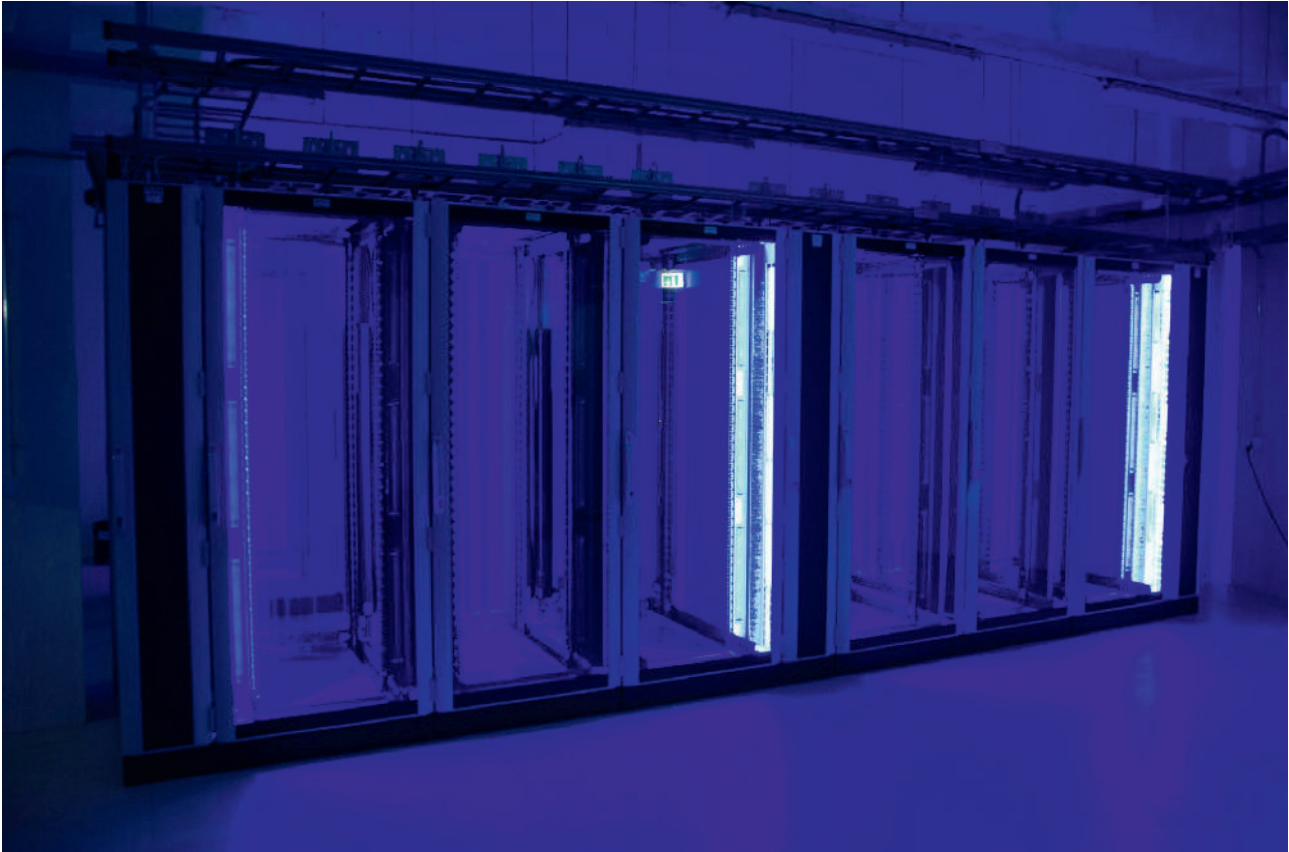


Photo: Sven Tupits

To protect its data, Estonia developed the concept of data embassies – servers outside the country that are legally under Estonian jurisdiction. The digital copies of key databases they store can be accessed in the event of a major data incident in the country

The data embassy is an extension of the Estonian government cloud, meaning that the Estonian state owns server resources outside its borders. These will be used not only for data backup, but also for operating critical services. As with physical Estonian embassies, the servers are considered sovereign embassies in foreign data centres.

Estonia launched the world's first data embassy in partnership with the government of Luxembourg.

While opening the first data embassy involves placing Estonian systems and data in another country, it creates an additional security guarantee for Estonian sovereignty. Estonia will back up critical data and services important for the functioning of the state outside the physical territory of Estonia, while Luxembourg guarantees that the data and the servers are protected by the same legal guarantees as the data and servers in Estonia. This approach will help ensure the country's digital continuity – its capability to maintain services and digital data regardless of interruptions. The data embassy benefits Estonian citizens, who will be the recipients of a more reliable and secure digital society. Additionally, it creates an extra security guarantee for the e-residents of Estonia, who expect Estonian digital services to be available at any time independent of location.

6. GovTech

To provide the most innovative solutions to our public sector clients, PwC has set-up cooperation with leading GovTech companies, including startups and SMEs.

But what is GovTech?

There are three important ingredients:



Using digital to deliver new, better ways to enable citizens to engage in their communities and receive the public services they need.

Fuelled by new technologies, joining up data and services in a mobile, connected world.

Created by entrepreneurs, innovators and Small and Medium sized Enterprises (SMEs) – often people who have worked in public services and can see exciting new ways of delivering improved outcomes and more efficient public services.

Across the world, the modern state is undergoing an extraordinary transformation. In time, the whole way a state engages with its citizens will be different.

GovTech has the power to transform the delivery of public services, achieve better for less and improve the user experience.

GovTech can help to provide public services that are cheaper, can be adapted to changing demand and can reach more people. GovTech can also help join up disparate existing services into more easily accessible and integrated solutions, offering the potential of one 'customer journey'. Government and public sector organisations can then stay focused on the things that only they can do and deliver the outcomes the public wants and needs.

From a citizen's perspective, using GovTech solutions will bring better services, one-stop shops and more engaged communities. It will enable an improvement in the user experience and better outcomes. And the savings made will allow funds to be re-directed to more valuable services.

PwC Estonia Government Technology and Digital Transformation Services

The key elements of building an e-government

- Political Will, Supportive Organisation & Legislation
- Digital Identity
- Digital Databases, Secure Data Exchange & Interoperability
- Cyber Security & Data Integrity

The European Commission has defined e-government as “the use of ICT in public administration combined with organisational change and new skills to improve public services and democratic processes and strengthen support to public policies.”

Moving from analogue to digital is not only about technology. Public services have to be re-invented which requires changing the mindset of the officials.

Domain expertise

Digital Identity	Secure Data Exchange	Public Sector Blockchain	e-Government Services Audit	Digital Healthcare
Digital Embassy	e-Residency	Cyber Security	Change Management	Policy Analysis & Legal Drafting

Our Government Technology and Digital Transformation practice combines the best of technology-led government consulting and IT implementation in the government & public sector units, providing our customers with an option to have a true Transformation Partner for their digital transformation agenda.

PwC brings you e-Estonia as a one-stop shop

We help you in the whole process of building a working digital society based on Estonia's experience. Our multidisciplinary approach allows us to provide services beyond the audit and taxation lines we are known for. Our consultants and technology partners are experienced in organisation design, change management and technology implementation. PwC Legal has the expertise to assist you at policy analysis and legal drafting.

Our approach

Project Funding

We help to combine local funding with international grants and loans. PwC has close cooperation with the United Nations Development Programme, Good Governance Fund, and the European Commission to name a few.

e-Services Audit

We will conduct an AS-IS analysis of the current situation inspecting legislation, technology, and processes used.

Legal Infrastructure & e-Governance Policy

We will help to create an e-governance policy. Our legal experts will recommend and draft changes in the legislation and regulations.

Technological Infrastructure

We will set the IT system architecture requirements and work with our external partners to assure the implementation of required hardware and software.

Service Design

We will help to re-design and modernise public services putting their users – the citizens in the centre. That helps to reduce administrative burden, workload and save work time.

Change Management

We will propose changes in the organisation structure to guarantee seamless workflow process.

Trust & Awareness Communication

Both government officials and citizens need to understand the value that e-governance can bring to society. It enables them to achieve better for less and improve the quality of lives.

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