



Two Countries / Two Decades / Two Outcomes

A brief comparison of e-government solutions in Estonia and Switzerland

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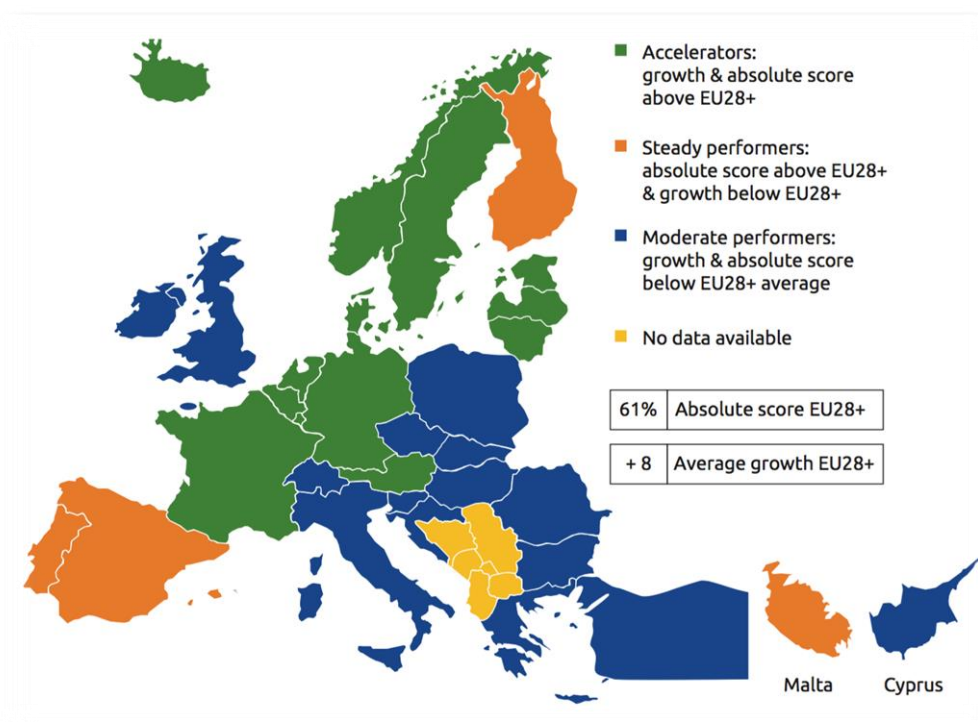
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1. Introduction

This report sheds new light on the implementation of e-government in Switzerland and examines the current stage in this process. Using the case of Estonia as a comparison and best-practice example, we show the way e-government instruments are implemented, which are the main challenges and opportunities for Switzerland. In our report, we present a timeline of the development of e-government and present four policy areas in more detail. The introduction of electronic government instruments in Switzerland is part of a larger strategy for the information age and is based on the OECD Recommendation of the Council on Digital Government Strategies.¹

In particular, we part from the rather astonishing conclusion of a recent report published by the European Commission² regarding the advancement of European countries in the area of e-government. Switzerland, as seen in Figure 1, is part of the group of “moderate performers, with growth measurements and the absolute score that are situated below the EU28+ average. Switzerland is thus part of a group including most countries of Eastern Europe and Turkey. Estonia, to the contrary, and although being a former Soviet Republic, can be found among the “Accelerators”, where both growth and the absolute score are above the EU28+ average.

Figure 1: “eGovernment Benchmark 2016” illustration



¹ E-Government-Strategie Schweiz 2016.

² eGovernment Benchmark 2016. A Turning point for eGovernment development in Europe? <https://ec.europa.eu/digital-single-market/en/news/eu-egovernment-report-2016-shows-online-public-services-improved-unevenly>.

In our report we will therefore try to systematically compare the two countries' trajectory towards e-government. It will try to answer the following questions:

- How is e-government implemented and how far is Switzerland in this process?
- How can we understand the development of e-governance in Estonia?
- What has made it work?
- What can Switzerland learn from it?
- What could be done in Switzerland to improve e-government services?
- What could make Switzerland unique in the context of e-government?

The main goal of the report is thus to develop a selective overview of the current situation in Switzerland and to compare it with Estonia, which has successfully introduced a nationwide e-government system. The case studies and the comparison provide useful information on the advantages and disadvantages of different approaches to develop and introduce e-government instruments in the Swiss context. Moreover, the report aims to sort out areas of e-government that are particularly interesting for new ideas and adaptations to current megatrends in ICT-society interactions.

We are working with a number of key concepts that are defined as follows:

E-government encompasses modern information and communication technology (ICT) based government services. These services focus on government to citizen (G2C), government to business (G2B), government to government (G2G) or government to employees (G2E) interactions.³

E-tax: encompasses ICT-based services related to the tax system. This comprises electronic tax-forms and the possibility to submit these forms electronically as well as the technical standards and software solutions needed for the administration of tax declarations within the public administrations and in contact with taxpayers.

E-voting: The use of ICTs for casting ballots remotely over the Internet in elections and popular votes.

E-identity is a standard for secure online identification and electronic document signing.

E-health is the pooling of data and services related to health issues: Data from different sources (hospitals, health insurances, doctors, other therapeutic institutions) are pooled and combined to increase efficiency and to enable better healthcare.⁴

The report is divided into four parts. The first part focuses on the development of e-government in Estonia. The second part deals with e-government in Switzerland. Both country analyses start off with a historical overview of the introduction of e-government

³ Glaser (2015); UN Department of Economic and Social Affairs (2016); von Lucke and Reinermann (2000).

⁴ See <http://www.e-health-suisse.ch/grundlagen/index.html?lang=de>.

instruments, followed by four in-depth case studies on different e-government areas: e-health, e-voting, e-tax, and e-residency/e-identity. These case studies were chosen for highlighting important aspects, advantages and downsides of the introduction of e-government. They are also arguably the most topical and timely areas of e-government efforts in modern liberal democracies. The third part of the report is dedicated to the comparison of the two countries' efforts in the e-government implementation process. The fourth part concludes.

2. Estonia

2.1 Introduction

Estonia is considered one of the most advanced e-societies in the world. The success of Estonian digital transformation was first recognised in the early 2000s when Estonia outperformed much wealthier countries in terms of online service provision and online participation in several of the international studies comparing the maturity of digital governance.⁵ The Estonian experience in using the Internet and its technologies to modernise this former Soviet Republic has puzzled and impressed many observers. The strong international interest in its development has never really faded. To the contrary: Estonia increasingly becomes a reference in terms of e-democracy, e-government and e-innovation.

In this report, we will give a short overview of the journey that Estonia has taken since it gained its independence from the Soviet Union in 1991. Two years later, the first web-browser was invented, opening up the Internet to the masses. At that time, Estonia, in a need to catch up with western countries, was looking for ways to modernise its government and society. The potential of technologies in this process was soon understood, and the first major initiative - a schools' computerisation programme called "Tiger Leap"⁶ was launched in 1996, providing an important impetus for the development of an e-society in Estonia. Over the past two decades, this journey has taken Estonia to where it stands now, i.e. having 100% Estonian schools connected to the Internet. Furthermore, 95% of the tax returns are submitted electronically via the e-Tax Board, 95% of all medications are bought with a digital prescription (2015), and 30% of the votes are cast over the Internet in European, national, and local elections. This report explores the reasons for the successful development of e-governance in Estonia, looking at the potential role of legislation, management and cooperation, and different stakeholders in this process. We will go beyond the success stories, though, and also highlight some of the shortcomings in the Estonian e-governance experience.

2.2 Overview of the development of e-governance in Estonia (1991-2016)

The first step in the digital transformation of Estonia was taken in 1991⁷ when the dial-up connection was established between the Estonian Government and the State Chancellery (Vallner and Tammet 1999). In 1994, the Estonian government opened its first ever website and, at the same time, a short strategy paper was prepared by a small IT community – a

⁵ In 2003, Estonia ranked no 13 in the web measure index (now online service index) and no 5 in the e-participation index of the United Nations e-Government Survey and has held similar positions since then. See: <https://publicadministration.un.org/egovkb/en-us/Global-Survey/UN-E-Government-Survey>. Similarly, other studies have given Estonia high scores for its performance in digital governance, such as The Digital Economy & Society Index (no 1 in 2016). See: <https://ec.europa.eu/digital-single-market/en/desi>.

⁶ The "Tiger Leap" programme („Tiigrihüpe“ in Estonian) was managed by the Tiger Leap Foundation in 1997-2013. On May 1, 2013, it was merged with the Information Technology Foundation for Education. See: <http://www.hitsa.ee/en>.

⁷ Vallner and Tammet (1999).

loose network of government officials, IT specialists, and academics with the aim to lay down the main principles for the functioning of state information systems (Ott and Siil 2003⁸). In 1993, a central IT department – the Department of State Information Systems (RISO) was established at the State Chancellery of Estonia⁹, marking the beginning of central coordination of IT developments in Estonia. After that, all IT development plans of all ministries and agencies had to be submitted to and approved by the central IT department and the expenditures included in a budget under a separate category “Number 37” (Ott and Siil 2003).

In 1996, the “Tiger Leap” programme was proposed by then Estonian Ambassador to the United States and later President of Estonia Toomas Hendrik Ilves¹⁰, together with the Minister of Education Jaak Aaviksoo. It was launched in the same year¹¹ and the Tiger Leap Foundation¹² was created to manage and coordinate this initiative with the main goal to connect all schools to the Internet, equip schools with computers and start using technology in the teaching and learning process. Even though the programme had an emphasis on education, its impact was greater than originally expected and it ultimately gave a strong impetus for the development of Estonia’s information society. The “Tiger Leap” programme was the first initiative that was fully supported by the state (moderate as it was though) as, at the time, the Estonian government did not yet engage the ICT sector, it did not have an IT industry policy, nor had the IT sector shown interest in the cooperation with the government. Still, it took a couple of years before e-government developments took off. Only in 1998, the Government adopted its first “Principles of Information Society”, a very general document building on what had been proposed five years before¹³. The same

⁸ Ott and Siil (2003). Available at (in Estonian): <http://arileht.delfi.ee/news/uudised/eesti-e-riik-tulgu?id=50946222>.

⁹ In 2000, the State Information Systems Department (RISO) was moved from the State Chancellery to the Ministry of Transport and Communications and in 2002, due to the merger of the Ministry of Transport and Communications and the Ministry of Economic Affairs to the then established Ministry of Economic Affairs and Communications.

¹⁰ In 2011, in his keynote speech at the Conference on Theory and Practice of Electronic Governance (ICEGOV 2011) in Tallinn, then President of Estonia Toomas Hendrik Ilves referred to the book by Jeremy Rifkin called „The End of Work“ as a source of motivation for digitalisation in Estonia. This book predicts that automation and computerisation will take work away from people as Rifkin wrote that, in Kentucky, 12 000 steel workers had lost their jobs due to the automation of the steel mill. „But from the Estonian perspective, it was intriguing, because our fundamental existential angst is tied to our smallness. So, I reversed the logic and said that was how we could increase our functional size by many orders of magnitude...From there I figured, we ought to computerise as much as possible“. The speech given in ICEGOV 2011 is available at: <https://www.youtube.com/watch?v=7QrM6hvgdi8>. The President has made a reference to the book in several occasions when introducing e-Estonia to the world.

¹¹ The project was announced by Lennart Meri, the President of Estonia, on 21 February 1996. Funds for the Tiger Leap Foundation were first allocated in national budget of 1997. The proposed idea to take computers and the Internet into schools, however, was modified by the Tiger Leap working group and several experts (Mart Laanpere) suggested adding teacher training to the original plan. In later years, it has been recognized that the success of the “Tiger Leap” programme lied largely on training teachers on how to use technologies in the teaching and learning process.

¹² On May 1, 2013, The Tiger Leap Foundation merged with the Estonian Information Technology Foundation and The Estonian Education and Research Network EENet. Since then, it is under The Information Technology Foundation for Estonia (HITSA), see: <http://www.hitsa.ee/en>.

¹³ The main persons involved in the preparation and adoption of the principles were the members of the Informatics Council (later renamed Information Society Council, now e-Estonia Council): Arvo Ott (RISO), Imre Siil (Estonian Informatics Centre, now RIA), Ivar Tallo (external expert), and Jaak Tepandi (Professor at Tallinn Technical University). Source: Infoühiskonna Aastaraamat 1998 (Estonian Information Society Yearbook 1998).

year, the government-wide backbone network EEBone (“PeaTee” in Estonian, which means “Main Road”) was launched, connecting all government institutions with the Internet and Intranet¹⁴. The rapid development of EEBone, in turn, encouraged to undertake new infrastructure developments and, in 1999, the program “KülaTee” (“Village Road”) was initiated with an ambitious plan to connect over 90 % of Estonia's 247 local governments to the Internet by the end of 2000.¹⁵

Estonia owns its e-governance success to two main building blocks: the Data Exchange Layer X-Road and the electronic identity (eID), the preparations of which started in parallel with the formulation of Estonian information society principles and setting up the infrastructure. In the following we will briefly discuss their preparatory process, set-up and functioning as well as legislative and organisational framework.

2.2.1 Case Study No 1. The Data Exchange Layer X-Road

In 2000, the government IT department RISO together with the key IT personnel of various ministries and professors of Tallinn Technical University started to work on the concept of X-Road¹⁶ – a data exchange layer that forms the backbone of e-Estonia. The X-Road project idea was born out of the need to standardise the use of national databases as the development of information systems and e-services had reached a stage that increasingly required cross-use of data between different databases. The inspiration for the development of a central “tool kit” that all government institutions¹⁷ could use in building their information systems requiring data from the databases of various institutions was rather straightforward – the Estonian state did not have enough financial resources to accommodate the requests of government institutions separately¹⁸. Accordingly, the X-Road concept was developed¹⁹ to create a secure and standardised environment for interconnection, enabling data exchange between different information systems in the public and private sector, in order to provide services to one another and the public. It took a mere year to prepare for the launch of the X-Road, starting with a concept and specification formulation in January-March 2001²⁰, choosing a winner for the development works through a public tender in May-September 2001²¹, and opening the first version of the X-Road in December 2001. Since then, the X-Road has been live without a single

¹⁴ RISO Riigikantselei (1998).

¹⁵ RISO Teede-ja Sideministeerium (2000).

¹⁶ Data Exchange Layer X-Road: <https://www.ria.ee/en/x-road.html>.

¹⁷ Later, when the X-Road concept was specified, it was decided not to limit it to governmental institutions only but open it to everybody, including companies and even physical persons.

¹⁸ From interviews with Ahto Kalja (project manager of the X-Road in 2000-2014) and Arvo Ott (Head of the RISO in 1993-2005).

¹⁹ The X-Road project was initiated by the Department of State Information Systems (RISO); yet, the concept was prepared by six professors of Tallinn Technical University, lead by Ahto Kalja who later became the project manager of the X-Road and served in that position until 2014. At the time, the RISO subcontracted an external project manager.

²⁰ The X-Road Concept was developed by six professors of Tallinn Technical University as a result of twelve meetings within three months.

²¹ The public tender for the development works of the X-Road was won by Assert AS that was later sold to a Swedish company after which the name was changed to Cell Networks. The best formulated proposal, however, was the one of IBM, a company that flew two proposal writers to Estonia from its headoffice in New York. At the time, IBM lost the tender because of an unreasonably high budget – the price exceeded the one of all the other offers together.

downtime. It currently connects more than 900 organisations, 200 public databases and registers²²; it provides 1'700 services with almost 600 million inquiries in a year²³. The Estonian X-Road experience also served as one of the models in designing the concept of the European Interoperability Framework.

The first register to be connected to the X-Road is the register that is needed in the case of all services – the Population Register that contains the main personal data²⁴ on Estonian citizens, EU citizens residing in Estonia and e-residents. As the Population Register is connected to other systems and databases via the X-Road, it allows for the exchange of up-to-date data. Thus, when a person applies for a study allowance, or a social benefit, or files taxes all the relevant data is retrieved from the Population Register automatically. This means that there is no need to submit any documents or fill in forms etc. Each person can receive a service and access registries via the national portal www.eesti.ee with their eID or Mobile ID; citizens can also review and correct their data in the Population Register²⁵.

Organisationally, the X-Road Centre responsible for the well functioning of the X-Road was established within the Estonian Informatics Centre²⁶ and until the present, its operation is ensured by the central government, primarily by the Estonian Information System Authority (RIA). The main task of the RIA is to ensure the legal status of the X-Road system and the information exchanged by enforcing relevant policies as well as its further development. Among others, the RIA is in charge for enabling the connection of information systems and databases to the X-Road system together with several other state authorities pursuant to the Public Information Act, Personal Data Protection Act, and Estonian Interoperability Framework: the Estonian Data Protection Agency (AKI) the National Archive, the Land Board, and Statistics Estonia. Due to a large number of institutions involved in the process of giving permission to join the X-Road and the ambiguity over their exact roles and responsibilities²⁷, the process for joining the X-Road has been criticised for being rigid and challenging (OECD 2015). One of the main factors for the well functioning of the X-Road is seen in a good cooperation between different government institutions and the public sector that is facilitated both by the working groups of RISO and RIA but also through looser community networks. Since 2013, the X-Road community was also established by RIA.²⁸

²² For instance, the Population Register, the Business Register, the European Business Register, the Register of Constructions, the Central Procurement Register, the Land Register, etc.

²³ More detailed statistics about the X-Road: <https://www.ria.ee/en/statistics-about-x-road.html>.

²⁴ This includes names, unique personal identification codes, birth dates, place of residence, marital status, and other.

²⁵ The Population Registry, Ministry of Interior: <https://www.siseministerium.ee/et/tegevusvaldkonnad/rahvastiku-toimingud/rahvastikuregister>.

²⁶ Now the Estonian Information System Authority (RIA).

²⁷ The confusion derives from the Public Information Act (PIA) that, since 2008, regulates the maintenance and use of public sector databases. Pursuant to the PIA, Estonian Data Protection Inspectorate (and not RIA that is responsible for the good functioning of the X-Road) is the responsible institution for guaranteeing the compliance of security and other requirements of the databases and information systems. The PIA gives ground also to other ambiguity, namely, it applies to public sector but not private sector that also connects its databases and information systems to the X-Road.

²⁸ The X-Road Community: <https://www.ria.ee/en/x-road-community.html>.

The X-Road is regulated by the X-Road Regulation (2003)²⁹, a very laconic document that has been amended twice since its adoption: in 2008 to implement the amendments introduced to the Public Information Act (2008) and in 2016 to harmonise the new EU Directive on Trust Services and eID, known as eIDAS³⁰. Since 2008, the Public Information Act regulates the management of national information systems, including the X-Road. However, the main instruments in guaranteeing the well functioning of the X-Road have been documents of an advisory nature such as the Interoperability Framework³¹ guiding the work of Chief Information Officers (CIOs) of government institutions but also other officials and partners involved in the implementation of the X-Road.

2.2.2 Case Study no 2. The second building block: e-Identity (eID)

The second building block in the development of Estonia's e-government efforts is, without any doubt, the comprehensive system for electronic identification, authentication and digital signature. It can be considered a key enabler of Estonia's e-government success story and includes the ID card, the eID (or Digi ID, Digital ID), the Mobile ID, the digital stamp, the residence permit card, and as of 2014 also the e-residency card.

The identity of a person in Estonia is based on a personal identification number i.e., PIC³² that is the very core element of the identity system in Estonia. The PIC is printed on an ID card and it also included in the data file i.e., in the chip that is on the ID card. Thus, the ID card serves as a proof of one's ID in an electronic environment. The PIC is also contained in the two certificates that are saved on the ID card: one is used for authentication and the other for the digital signature. The PIC is used as the primary key in both public and private databases. With this system, Estonia has established a centralised identity management system and has been following it since 1992.

The Estonian ID card serves as the official identity document and it is the only mandatory ID document for everybody over fifteen years old. By now, almost all Estonian citizens have such a card (94%, i.e. 1.3 million citizens).³³ As mentioned before, the ID card also includes a Digital ID (eID) that can be used for both electronic identification and for providing a digital signature. Unlike the ID card, the eID is not designed for visual personal identification; therefore, it does not carry a photo or any physical security elements – simply the person's name, personal identification number and end of validity date.

²⁹ X-Road Regulation (2003): <https://www.riigiteataja.ee/akt/688079>.

³⁰ Directive of the European Parliament and Commission no 910/2014 on Trust Services and eID, adopted on July 23, 2014, p. 73-114, i.e., so –called eIDAS directive (see: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0910&from=EN>).

³¹ Current interoperability requirements can be found at: <https://www.mkm.ee/en/objectives-activities/information-society/state-information-system>.

³² PIC is given according to the Population Register Act, regulation on the generalisation of PICs and the Estonian Standard EVS 585:2007. It is a 11-digit PIN made of: gender/century of birth (one for both), date of birth, three random digits and an additional checksum digit.

³³ About the ID card and eID, including its use: <http://www.id.ee/> and <https://www.politsei.ee/en/teenused/isikut-toendavad-dokumendid/digi-id/>. A good overview of the Estonian system for electronic identification, authentication, and digital signing can be found in the report by e-Governance Academy (2016) "e-Estonia: e-Governance in Practice". Available at: <http://www.ega.ee/publication/e-estonia-e-governance-in-practice/>.

The ID card is based on the so-called public key infrastructure - or PKI-technology³⁴. In principle, the PKI uses an encrypting key pair: a public encryption key and a private decryption key. In Estonia, this technology is used in relation with the electronic identity (ID card, mobile ID, digital ID), and it includes two private keys (each key has a separate PIN): one for authentication and the other for the digital signature.

As the public key infrastructure used in Estonia is the national PKI, the functioning of the latter is assured by the state, primarily by the Ministry of Economic Affairs, RISO, and RIA. However, a large part of the services related to the PKI is purchased from the private sector. Similarly to the functioning of the X-Road, several working groups have been established.

The Digital ID project started already in 1997 as an idea for a second ID document in the form of an ID card that would also include Digital ID (eID) and certificates for an electronic signature. The preliminary analyses carried out in 1998 concluded that the existing digital identification technologies had reached a level to allow for a nationwide electronic ID card. And as the first round of passports that were issued in 1992 had to be renewed in 2002, it was then decided to use this opportunity to issue ID cards simultaneously with passports to reach a wide audience³⁵.

Contrary to the development process of the Data Exchange Layer X-Road, the preparations for a new identity document took longer than anticipated, in total five years from the establishment of the first working group by the Citizenship and Migration Bureau³⁶ in 1997 until the launch in January 2002. During this process, the Digital Signature Act was drafted, the Identity Documents Act was amended, and two companies were established: AS Sertifitseerimiskeskus³⁷ (Certification Centre) for providing certification services and TRÜB AG³⁸ for delivering the chip and certification equipped ID cards. The decision to give everybody in Estonia a chip and certificate equipped ID card, however, was made at the very late stage by then Prime Minister Mart Laar in October 2001 as advised by his IT advisor Linnar Viik. Shortly after, the government led by Mart Laar fell; yet, the change in government did not hinder the further introduction of the national ID card (and eID) and was continued as first planned (Martens 2010).

The first ID card was issued on January 28, 2002 to the President of Estonia. Since then, 1.27 million ID cards³⁹ have been issued and used 336 million times for its digital signature feature and 501 million times for authentication purposes. Despite the present active use of the eID for both authentication and digital signature, the uptake of the electronic use of the ID cards was slow, particularly in 2002-2006 when very few citizens seemed to care about the card. First, there were very few e-services offered, thus people had no real incentive to use the eID and, consequently, the awareness of the eID was very low. Second,

³⁴ Public Key Infrastructure (PKI) in Estonia: <https://www.ria.ee/en/public-key-infrastructure.html>.

³⁵ RISO Riigikantselei (1999).

³⁶ Citizenship and Migration Bureau is under the jurisdiction of the Ministry of Interior and since 01.01.2010, it is part of the Police and Boarder Guard Board (PPA).

³⁷ Sertifitseerimiskeskus was established by „the big four“: two banks (Hansapank and Ühispank) and two telecommunication companies (EMT and Eesti Telekom): http://www.avalikteenistus.ee/?id=45761&tpl=1063&c_tpl=1075.

³⁸ TRÜB AG is a Swiss-based company to which a Baltic subsidiary was created.

³⁹ More on ID card, including statistics: <http://www.id.ee/?lang=en&id>.

in 1996-2002 the only available online authentication modes were the ones of the banks through means such as PIN calculators and password cards, and people kept using them also after the introduction of the eID.

The first significant breakthrough came only in 2009 when the programme Computer Security 2009⁴⁰ was initiated in cooperation with the main banks, telecom companies, and the Estonian government to address security related issues including PKI based authentication methods such as Mobile ID and eID. Only after the banks decided to reduce the share of the password cards and PIN calculators as modes of authentication in 2009 and abolished their use in case of transactions equal to or over 200 EUR from January 1, 2011 onwards, ID cards started to be increasingly used. Indeed, one witnesses a sudden increase in the use of eID for authentication in Estonia. The reason for the popularity of the authentication modes offered by banks in Estonia, is that the Internet banking system is not exclusively used for traditional online banking purposes. In addition to the latter, Estonian banks offer third party services that can be accessed via Internet banking such as energy, water, gas, tax, etc. services. On the one hand, this has been one of the main facilitators of using online services, including online authentication; yet, on the other hand, it may have impacted the slow initial adoption of the eID.

2.2.3 Significance of the X-Road and the eID

These essential government steps in the foundation of e-governance Estonia – the X-Road and the eID – as well as the accompanying education modernisation initiative “Tiger Leap” provided ground for the largest public-private partnership project in Estonia – “Look@World”⁴¹ (“Vaata Maaailma”). Within three years, between 2002 and 2004, more than 100’000 citizens (about 10% of the Estonian population) were taught how to use the Internet and computers and more than 700 internet access points were opened all over Estonia. After the success of the project, the private sector agreed to continue financing similar public awareness projects, and in 2009, the project Computer Security started in cooperation with the government and the “big four” (two banks and two telecommunication companies) with an overall aim to promote the use of secure online authentication modes such as eID and mID. As a result, and as mentioned above, the use of e IDs increased considerably, from 25’000 in 2006 to 400’000 in 2010 when this initial project was achieved. Other follow-up projects continue to this day: during the project “Come Along” in 2009-2011, 100’000 people in Estonia were assisted to use e-services in the specially opened computer labs in more than 300 different locations in Estonia; between 2012 and 2013 the “Smart Lab” project to support IT studies in schools was run, and currently, the Look@World Foundation is working on issues related to Internet safety and the safe use of mobile phones.

⁴⁰ The cooperation agreement of the Computer Security 2009 was signed in 2006.

⁴¹ The project was and still is managed by the established Look@World Foundation: <http://www.vaatamaailma.ee/en/>.

2.3 Timeframe: E-services

The establishment and well functioning of the X-Road and the eID, accompanied with vast public awareness campaigns, provided a fertile ground for the development and use of online services in Estonia. Below, we apply a timeline to the introduction of e-services in Estonia. By doing so, we selected the most salient, visible and used developments. They range from taxation to voting and from policing to parking cars. We do so chronologically and by very briefly describing the goals of the services⁴².

- 2000. Case Study no. 3: **e-Tax Board**. Similarly to other countries, the first government institution to start providing online services in Estonia was the Estonian Tax and Customs Board (MTA) that launched the e-Tax Board application - an electronic tax filing system on October 18, 2000. The preparations of the systems started already in the late 1990s when the MTA interconnected its 21 branch offices throughout Estonia. The MTA's centralised information system that was launched on January 1998 served as a critical precondition for the subsequent development of the e-Tax Board⁴³. Inspired by the success of Internet banking, the first concept of the e-Tax Board was developed by a small group of mainly government and taxation experts in 1999. As a result of the EU Phare Project in March 2000, natural persons were given the possibility to file their income tax returns electronically via the Internet banking system of two major banks: Ühispank and Hansapank. It was initially used by 11'760 people, a figure that clearly exceeded the expected numbers (Tiirik 2002). The second phase of the project concluded in November 2000, and several other services were added such as the possibility for legal persons to file, view, and correct their value-added tax returns (VAT), income and social tax returns, submit VAT refund applications, etc. (Lindroos 2010). As of February 2002, taxpayers could log into the e-Tax Board both via the Internet banking and the MTA's website, using a national eID in parallel with the banks' authentication modes such as PIN calculators and code cards. The latter decision of the MTA was a deliberate one to draw on the public trust in online banking to build one in the e-Tax-Board.

The e-Tax Board was then expanded and supplemented by extra information to tax payers, but it reached its major developmental milestone in 2003 when the automated pre-filled tax declaration forms were introduced. To prepare the pre-filled tax forms, banks, insurance companies, educational institutions, employers, etc. must provide data to the MTA. The MTA then cleans and consolidates the data and pre-fills a tax return for a taxpayer and makes it then available on the Internet or in the service office. A taxpayer can then review and confirm, or correct the data in the pre-filled forms if needed, and submit it, after which, in five days, the refund will be made. The main principles and functionalities of the e-Tax Board have remained unchanged since 2003. Only recently, in 2014, the MTA finalised a new concept paper of the MTA - eMTA 2020 that includes a complete

⁴² A good overview of the e-services provided in Estonia can be found in the report by the e-Governance Academy (2016) "e-Estonia: e-Governance in Practice", available at: <http://www.ega.ee/publication/e-estonia-e-governance-in-practice/>. Additionally, the ICEGOV conference in 2011 included a three-day track on e-Estonia development, materials of which can be partly found at: <https://www.ria.ee/en/publications.html>. Also, there is a website on e-Estonia main components: <https://e-estonia.com/components/>.

⁴³ From an interview with Aare Lapõnin, Deputy Director of the MTA in 1994-2003, the initiator of the modernisation of the IT systems of the MTA, including the e-Tax Board.

refurbishment of the e-Tax Board⁴⁴. A vision that builds on the principles of the real-time economy aims to move towards a fully automated data exchange between the MTA and a place where the data on a tax object is being generated. In principle, the e-Tax Board 2020 ambition is to abolish the traditional declaration based tax filing system. The development costs are foreseen to reach EUR 30m, equal to the total sum of all the previous e-Tax Board development works⁴⁵. The first e-Tax Board was used by 11'760 persons, a figure that exceeded the expected numbers (Tiirik 2002). Still, in the following years the number of persons filing taxes electronically remained low until respective measures were introduced by the MTA and the Ministry of Finance⁴⁶. First, in 2003, it was decided to return the overpaid income tax to those persons submitting their tax declarations via e-Tax Board quicker than to those doing it in paper - in five days instead of a month. Second, in 2004, the MTA established a help desk to assist the users of the e-Tax Board and the same year, a Russian language version of the e-tax Board was introduced. Since then, the number of the e-Tax Board users has been increasing, amounting to 59% of Estonian tax payers in 2004, 92,4% in 2010, and 95% in 2015.

Regarding the gains, to our best knowledge, the cost/benefit analyses of the e-Tax Board is unavailable; yet, several estimations have been presented. Generally, the e-Tax Board is considered to have lowered the MTA's administration costs as, for instance, the printing costs have decreased from EUR 102'000 in 2000 to EUR 11'089 in 2009⁴⁷ and 40'000 working hours have been saved annually (Lindroos 2010). Additionally, the efficiency of the tax control mechanism has increased.

- 2000. The **e-Cabinet**, named VIIS in Estonian⁴⁸ is the information system of the government for its internal sessions, enabling ministers to prepare and conduct cabinet meetings, review minutes, and perform other tasks without paper. It was launched on August 8, 2000 with the support of then Prime Minister Mart Laar and his forward looking IT advisor Linnar Viik and developed by IT companies MicroLink Süsteemid AS, AS Datel and AS Pristis⁴⁹. At the time, the Estonian government was the first one in the World to prepare and conduct government meetings without paper. Benefits include a higher visibility of the government's modernisation efforts by mirroring the government itself as forward looking and transparent; also, the system built trust among the public and confidence among the business community. Furthermore, thanks to the system, the time spent per session went down, on average, from 4-5 hours to 30-90 minutes, and administrative costs were lowered as there was no longer a need for 17'000 printouts per week. Add to this the increased transparency and inclusion in the policy-making process (all ministerial positions become public before the cabinet meeting, decisions made at the cabinet meeting are posted on

⁴⁴ The e-MTA 2020 vision paper was sent to us by e-mail by Marek Helm, Director of the MTA in 2011-2017.

⁴⁵ From an interview with Marek Helm, Director of the MTA in 2011-2017. The tender for the first development works amounting to EUR 250'000 has been finalised and won by a consortium of IT companies lead by Nortal AS. The tender documents and the subsequent proceeding can be found in an electronic procurement environment (in Estonian): [https://riigihanked.riik.ee/register/lepingud/LepinguDetailvaade,\\$Form.sdirect](https://riigihanked.riik.ee/register/lepingud/LepinguDetailvaade,$Form.sdirect).

⁴⁶ In 2003, only 21% of the natural persons filed their income tax declarations electronically (Lindroos 2010).

⁴⁷ Calculations from a presentation sent to us by e-mail from Aare Lapõnin, Deputy Director of the MTA in 1994-2003.

⁴⁸ More info on e-Cabinet can be found at: <https://riigikantselei.ee/en/supporting-government/organisation-work-government>.

⁴⁹ From an interview with Aivar Rahno, Head of the Cabinet Secretariat, State Chancellery.

the website but can also be e-mailed to interested parties), and that for a minister it is possible to take part in the cabinet meetings remotely using audio-visual means.

- 2000. **m-Parking**⁵⁰ enables car drivers to pay for their city parking via their mobile phone provider. Initially, this system was based on text (sms) messages. By now, it works also with an online app for smartphones and tablets. Currently 90% of parking fees are paid via mobiles. Persons wishing to park can today either use the geo-location-based application or send an SMS with the parking zone's code. The cost of the monthly parking is added to the driver's mobile phone bill. The main benefit is convenience and for the municipality cost saving as the maintenance of the parking meter infrastructure can significantly lowered.

- 2003. The **e-Geoportal**⁵¹ offers information about maps, spatial databases and provides special data services, and it links to the e-Land Register⁵² and the geographical information system (GIS). Due to the connection with the X-Road that enables the delivery of real-time data, the e-Geoportal enables map-based visualizations that power many of the location-based services in Estonia.

- 2003. The **e-School**⁵³ has become one of the most widely used e-service in Estonia. It provides access to study related materials and information and is a tool for communication between students, parents, teachers, and school administration.

- 2004. The **e-Ticket**⁵⁴ is a ticketing solution for public transport. It was first introduced in the city of Tallinn with the aim to personalise public transportation tickets of its residents to connect it to the entitled benefits of certain groups such as students, elderly persons etc⁵⁵. Since September 2013, paper-based tickets are valid only for tourists.

- 2005. The **e-Police**⁵⁶ system comprises two main tools: a mobile workstation installed in each petrol car, and a positioning system used in the headquarters. As a result, officers can have instantaneous access to information from the database of the police but also the Motor Vehicle Registration Center, the Traffic Insurance Fund, the Population Register, the Weapons Register etc. Additionally, the operations centre knows the exact location and status of petrol vehicles.

- 2007. **e-Business**. The central e-Business Register⁵⁷ that is connected to the Commercial Register, the Register of Non-Profit Associations, and the Commercial Pledge Register allows, via the Company Register Portal⁵⁸ to establish a company in 18 minutes.

⁵⁰ About m-parking in Tallinn: <https://www.parkimine.ee/en//Parking/tallinn/how-to-pay/mobile-parking>.

⁵¹ Geoportal: <http://geoportaal.maaamet.ee/eng/>.

⁵² The e-Land Register includes information on all ownership relationships and limited rights of real estates and land parcels, see at: <http://www.rik.ee/en/e-land-register>.

⁵³ About eSchool (eKool): https://www.ekool.ee/index_en.html.

⁵⁴ Tallinn City Municipality: <http://www.tallinn.ee/eng/pilet/>.

⁵⁵ Currently, public transport is free for the residents of Tallinn.

⁵⁶ About e-Police: <https://e-estonia.com/component/e-police/> and <https://www.politsei.ee/en/>.

⁵⁷ e-Business Register: <https://ariregister.rik.ee/index?lang=eng>.

⁵⁸ The Company Registration Portal: <https://ettevotjaportaal.rik.ee/index.py?chlang=eng>.

- 2008 **e-Health**. The Estonian National Health Information System was launched in 2008 and includes several components such as Electronic Health Record, Digital Prescription, Digital Registration, Digital Image, Digital Emergency etc. Two of the services are of particular interest: The Electronic Health Record and Digital Prescription. **The Electronic Health Record**⁵⁹, launched in 2008, is a nationwide system that integrates data from Estonia's different healthcare providers to create a common record for each patient. As a result, it includes data on patients' diagnoses, visits to doctors, tests, hospital treatments, medication, etc. In an emergency situation, a doctor can receive time-critical information such as blood type, allergies, ongoing medication, pregnancy, etc. As the e-Health System also includes a Patient Portal,⁶⁰ patients can access their medical information by logging into the portal with an eID. In 2010, the **e-Prescription**⁶¹ was launched, being currently the most successful of all the initiatives of the e-Health system. The Digital Prescription, developed and managed by the Estonian Health Insurance Fund is a system for issuing and handling medical prescriptions. In 2015, 95% of the prescriptions were issued electronically; yet, the service was not an immediate success. In 2010, an obligation for pharmacies to *process* all prescriptions digitally was established; still, it did not have the desired impact as doctors continued issuing prescriptions on paper. The intensified use was witnessed only later, in 2011, when it became mandatory to *issue* prescriptions electronically⁶².

Some of the projects within the e-Health system have faced severe delays in the implementation such as the Digital Registration. The reasons for these complications are many, deriving from the involvement of various stakeholders, ambiguity and disagreements over the exact roles and obligations of the partners, or poor project management.

Organizationally, the responsible institution is the Ministry of Social Affairs and the authorized one the e-Health Foundation that was established in 2005 to develop and manage the components of the health information system.⁶³

- 2014 Case Study no. 4: **e-Residency**. Estonia is the first country to open up its e-services to non-nationals by issuing a transnational digital identity – e-Residency⁶⁴ enables access to Estonian online services to anyone in the world, including a possibility to i) digitally sign documents (and contracts), ii) establish and manage a company online, iii) open a bank account and do online banking, and iv) declare taxes online. According to the

⁵⁹ Electronic Health Record: <http://www.e-tervis.ee/index.php/en/health-information-system/electronic-health-record>.

⁶⁰ Patient Portal: <https://www.digilugu.ee/login;jsessionid=A0259C75503A921ECD899E9CBD2B4AB2?locale=en>.

⁶¹ Estonian Health Insurance Fund: <https://www.haigekassa.ee/en/digital-prescription>. A good overview of the digital prescription can be found in the Master Thesis of Priit Kruus "Developing and Evaluation Framework for the Country-wide Electronic Prescribing System in Estonia", available at: https://www.sm.ee/sites/default/files/content-editors/eesmargid_ja_tegevused/Uliopilaste_teadustoode_konkurss/p_kruus.pdf.

⁶² The obligation for doctors and other authorised persons to issue prescriptions electronically was implemented in two phases. In 2011, only those prescriptions had to be issued electronically that were to be compensated by the Estonian Health Insurance Fund. Since 2012, all prescriptions have to be issued electronically.

⁶³ The decision to establish a separate foundation to develop e-health systems was a deliberate one, to avoid the cumulation of power at the Estonian Health Insurance Fund.

⁶⁴ See more about e-residency at: <https://e-estonia.com/e-residents/about/>.

e-Residency concept⁶⁵, the main aim of e-residency is the advancement of Estonian economy, science, education, and culture. As importantly, e-Residency serves a political intent to reinforce the image of Estonia as a tech-savvy country. This perspective is further highlighted in the Estonian information society development strategy Digital Agenda 2020 for Estonia.

Technologically, the e-Residency card is based on the Estonian Digital ID solution and is the official national digital document for personal identification in an electronic environment and for digital signatures. As the e-Residency functions as an identification document in a virtual world, in order to authenticate a person, the applicant must provide biometric data when receiving the card⁶⁶. The e-Residency application process is based on the principles and requirements of the Aliens Acts (2009)⁶⁷. Consequently, it must be kept in mind that e-Residency is a privilege, not a right, and the refusal to grant somebody e-Residency does not have to be justified and it can be taken away when misused.

In principle, the e-Residency project started already in 2008 when Estonia opened its e-services to foreigners in two ways. First, from 2008 onwards, citizens of the EU member states who operated a similar identification system to Estonia: Belgium, Finland, Portugal, and Lithuania could authenticate themselves the same way as those holding an Estonian eID as Estonia then accepted the certificates of these countries (Martens 2010). Second, in 2009, after the relevant amendments to the Identity Documents Act (2009), Estonia started issuing Digital IDs (eIDs) to foreigners regardless of whether the person also applied for Estonian citizenship, residency, or an ID card.⁶⁸

However, issuing eIDs to foreigners never took off until, in 2014, the idea “10 million e-Estonians by 2025” was presented to the Estonian Development Fund idea competition.⁶⁹ The first e-Residency card was given out on December 1, 2014 by the Estonian President Toomas Henrik Ilves to the British journalist, Senior Editor to the Economist Magazine Edward Lucas who was granted the latter due to his long time relations with Estonia. Within one month, 391 applications were submitted, out of which 114 received a positive answer by the end of 2014; by December 2016, the number of applications had reached 15’662 out

⁶⁵ Issuing digital identities to non-residents: creating e-residency. Concept. Appendix to the explanatory memorandum to draft legislation of Estonian Identity Documents Act and State Fees Act. Appendix 1. The amendment was initiated by the Ministry of Interior in May 5, 2014, and the subsequent proceedings can be found at (in Estonian): <https://eelnoud.valitsus.ee/main/mount/docList/b54cb986-5df6-481a-ad9b-c95b938e8611>.

⁶⁶ To our best knowledge, no biometric data is taken from those people who receive e-residency in the initiative of Estonia, i.e., they receive it as a gift, for example, Ministry of Foreign Affairs has been issuing e-residency cards to Estonian consulates etc.

⁶⁷ Aliens Act (2009): <https://www.riigiteataja.ee/en/eli/522042016002/consolide>.

⁶⁸ The 2009 amendment to the Estonian Identity Documents Act foresees the issuance of Estonian Digital ID (eID) to foreigners, regardless of whether the person simultaneously applies for the Estonian permanent residency and/or ID card or not. The 2009 amendments are available at (only in Estonian): <https://www.riigiteataja.ee/akt/13183087>.

⁶⁹ The idea was presented by Taavi Kotka, Ruth Annus and Siim Sikkut. The Estonian Development Fund is a public institution subject to the Parliament investing in innovative companies for the purpose of contributing to Estonian economic development. More about the idea as presented and the discussion over it (in Estonian only): <https://2014.arenguidee.ee/ideas/146-10-miljonit-eeestlast-aastaks-2025>. The idea’s presentations are available at (again, in Estonian): <http://www.arengufond.ee/2014/06/arenguidee-konkursi-2014-loppurituse-salvestused/>.

of which 14'604 were granted e-Residency and out of which 11'838 had actually received it, in total from 136 countries⁷⁰.

At the time of the launch of e-Residency, as already mentioned, the Identity Documents Act (2009 amendments) allowed for the issuance of eIDs to foreigners; yet the leaders of e-Residency stressed on the importance of changing the existing Identity Documents Act to add a separate clause on e-Residency to the latter⁷¹. As a result, on December 1, 2014, the amendments to the Identity Documents Act and State Fees Act entered into force, implementing the concept of e-Residency, introducing the term “e-Resident” instead of the previous clause “issuing eID to foreigners”, and establishing the Estonian e-Resident digital ID as the identity document. At the time, no other legislative changes were introduced.

The financing of the e-Residency programme does not seem to be fully transparent due to the involvement of several institutions, and, thus the exact costs remain unknown to the public. Similarly, the impact of e-Residency on the Estonian economy and culture is to be determined. However, without any doubt, with the help of e-Residency, Estonia has moved closer to what it has stated itself within the Estonian Information Society Development Strategy, i.e. the Ministry of Economic and Affairs and Communications produced “Digital Agenda 2020 for Estonia” (p. 2)⁷²: „The aspiration for Estonia is to become as re-known for its e-services as Switzerland is in the field of banking.“

Since 2010, the development of internal e-services has somewhat slowed down as the priority has shifted, as mentioned, to the marketing of the Estonian e-governance experience through the e-Residency project but also through other cross-border e-services, most notably to the development of mutual e-services together with Finland. In December 2013, the Prime Ministers of the two countries signed the Memorandum of Understanding (MoU) in the area of information and communication technologies - the first ever digitally signed document between governments. Under this MoU, the two countries agreed that Estonia would share the source code of the Data Exchange Layer X-Road to be used in Finland and that the two countries would continue developing it together with an overall aim to share data and e-services. Despite the MoU, it took almost three years before Estonia opened the X-Road source code in October 2016 and soon after, in November 2016 the two governments agreed to establish an NGO - Nordic Institute for Interoperability Solutions to execute the plan. The main development plans include cross-border access to digital prescriptions by 2017-2018 and full patient medical history by 2018-2019.

Despite the political will and the governments' commitments, the implementation of the plans has been slow. Different degrees of dedication may hinder the progress as Estonia might see more utility in developing common services. First, more Estonians live in Finland and, second, the planned cross-border services would rather serve the Estonian government ambition to be the World pioneer in digital innovation. Also, in 2013-2014, the

⁷⁰ Monthly data on the no of applications, their origin and the no of refusals/acceptance was sent to us by Mr Kaspar Korjus, the project manager of e-Residency. Currently, the data on the use of the e-residency eIDs is not available, thus, it is not yet possible to analyse the potential impact of the e-residency on the enhancement of culture, economy, and education as foreseen in the concept.

⁷¹ e-Residency concept.

⁷² Digital Agenda 2020 for Estonia: https://www.mkm.ee/sites/default/files/digital_agenda_2020_estonia_engf.pdf.

EU Structural and Investment Funds' financing cycle was to come to an end; thus, the financial resources were scarce.

For the reasons stated above, with the exception of e-Residency, the Digital Agenda 2010 for Estonia is yet to materialise. Several of the planned activities such as using big data and data analytics but also linked open data for better decisions and services have not yet been initiated. Similarly, the fulfilment of some of the aims is questionable as the one aiming at increasing the number of people working in the ICT sector by 50% by 2020. Additionally, for some observers Estonia is lagging behind in several of the trends such as augmented reality, artificial intelligence, or already mentioned open and big data.

2.4 Timeframe: E-democracy and E-participation

The development of e-participation, when compared to the one of e-services, has been lagging behind both in terms of the ambition and progress of the Government and the awareness and use of the provided e-participation tools among the public. In 2013-2014, only 1% of the Estonian public had expressed their opinions via the e-participation tools provided by the government while 3% had done so via civil society organisations' managed portals⁷³. The situation seems to have worsened with the exception of Internet voting that has been constantly improved both in terms of its security and user-friendliness. The expansion of Internet voting is also reflected in the steady increase of its use since 2005.⁷⁴

Due to a lack of political interest as well as limited management and coordination at the State Chancellery, there has been little progress since the launch of the national participation portal www.osale.ee in 2008 and the pioneering system EIS in 2011 that opened the proceedings of legislative acts to the public. Similarly, the very recent commitments of the government in advancing the use of ICTs for inclusion and participation are modest. For example, the Digital Agenda 2020 for Estonia uses indicators of such as: i) "share of ministries publishing feedback on their websites about the results of public consultations" and ii) „share of Internet users having used the possibilities of e-inclusion“ whereas the latter includes also Internet voting and any form of communication between the government and the public via online tools or even social media. Furthermore, the recent progress report on the implementation of Estonia's second Open Government Partnership Initiative's action plan finds that the circle of the nongovernmental actors involved in the policy making process remains small⁷⁵.

In the following, we give an overview of the main milestones in the development of e-participation in Estonia, including both government initiated and civil society led initiatives:

⁷³ TNS EMOR (2014) "Kodanike rahulolu riigi poolt pakutavate avalike e-teenustega 2014". Available at (in Estonian): https://www.mkm.ee/sites/default/files/avalikud_e-teenused_2014_lopparuanne_tns_emor_korrigeeritud05022015.pdf.

⁷⁴ See in particular Vassil, Solvak, Vinkel, Trechsel, and Alvarez (2016).

⁷⁵ Open Government Partnership Initiative (OGP). Independent Reporting Mechanism (IRM) Progress Report 2014-2015: Estonia. Available at: http://www.opengovpartnership.org/sites/default/files/Estonia14-15_English_Financial_0.pdf.

- 2001. A participation portal called **Today I Decide (TOM)** was launched by the State Chancellery in June 2001 to allow people to propose new legislation or by suggesting amendments to the existing laws. By launching TOM, the Estonian Government was one of the pioneers in e-participation of the time that was reflected in several international comparisons⁷⁶. However, after its initial success, the portal suffered from low numbers of users (it continued having a few “megausers”, though) and a general lack of constructive dialogue between the people and the government officials. TOM was incorporated into the all-governmental participation portal OSALE in 2008.

- 2005. **Internet voting**. Since 2005, it is possible to cast a ballot online via an Internet-connected computer from all over the world. Despite a moderate start (2% of all votes were cast online in 2005), due to its convenience and a general trust in the system, the proportion of Internet cast votes rose to 30% in 2015⁷⁷.

- 2008. **www.osale.ee** has remained the central participation portal managed by the State Chancellery since it was launched in 2008 and includes, amongst others, search possibilities across governmental documents, the launching of bottom-up legislative proposals to the government, as well as public consultations on draft acts.

- 2010. The platform **www.petitsioon.ee** was set up the Central Confederation of Owners, the Estonian homeowner lobby group. It serves as an online petition tool and has, at times, attracted a high number of users. In 2012, a petition called Harta 12 received 18’210 signatures and became a driving force behind the Rahvakogu (People’s Assembly) process we turn to now.

- 2012. **www.rahvakogu.ee** The People’s Assembly was initiated by active NGOs with an overall aim to improve the democratic process in Estonia. It allows citizens and organisations to crowd-source ideas and proposals on how to make politics participatory. In little time it obtained over 2’000 proposals of which 18 were selected and presented to the People’s Assembly which physically met. On the so-called “Deliberation Day” in April 2013, 2 ideas were dismissed and the 16 remaining ones handed over to Parliament by the President of the Republic. Out of these 16 ideas, three have been fully implemented, four partly implemented, and additional three included in the Coalition Agreement of the Government that assumed office in March 2014.

- 2013. In that year, several municipalities also introduced forms of **Participatory Budgeting**, namely Tartu (the second largest town in Estonia), Viljandi and Kuressaare. Participatory Budgeting was first proposed in the Brazilian city of Porto Alegre in 1989, allowing citizens to decide about the allocation of parts of the city’s budget through deliberative processes. In Tartu, for example, citizens could for the first time in 2013 propose and decide about the

⁷⁶ No 5 in the e-participation index of the UN e-Government Survey in 2003, available at: <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2003>. TOM has also been implemented by other national governments, for instance, Slovenia.

⁷⁷ Vassil et al. (2016).

allocation of 1 per cent of the city's annual budget (i.e. EUR 140'000). The process is e-enabled.⁷⁸

- 2016. **www.rahvaalgatus.ee**. This NGO initiated and managed public participation platform enables citizens to prepare, and sign petitions and send them to the Parliament if they receive the support from at least 1'000 citizens. The platform also provides an opportunity to follow the progress of the petition until the latter becomes (or does not become) a draft act. www.rahvaalgatus.ee was born in the process of Rahvakogu mentioned above.

When looking at the legislative and regulatory framework in the field of e-participation in Estonia, we can conclude that the latter is rather well developed and provides for the advancement of main principles within the policy making process. The Public Information Act (2000)⁷⁹ established an important foundation for e-democracy, obliging all public institutions to keep websites and provide extensive online content of public interest, including drafts of policy documents and legislative acts. Several important processes for democratic development have stemmed from the Estonian Civil Society Development Concept⁸⁰ first adopted in 2002 as well as the Good Engagement Practices adopted by the Government in 2011.⁸¹ Citizen engagement and the use of technologies have been in place since the 1990s and early 2000s and more detailed regulations have been established recently such as the one concerning e-petitions⁸². Thus, the legislative framework cannot be considered the main barrier for the advancement of e-participation. The latter is rather hindered by a certain lack of interest in both politics and government. This, in turn, is reflected by limited management and organisational efforts scattered across the State Chancellery, Ministry of Justice, and Ministry of Economic Affairs and Communications. The network of participation coordination has ceased to exist and a person responsible for this dossier is missing in several ministries and agencies. Additionally, the financing is scarce. Regarding the latter issue, the budget for the development of citizen participation (including e-participation) for the years 2015-2020 amounts to EUR 440'000. This does not include, however, the maintenance of the information systems and state portals.

⁷⁸ Participatory budgeting in Tartu: <http://ega.ee/project/participatory-budgeting-in-tartu-city/> and <http://www.tartu.ee/et/kaasav-eelarve>.

⁷⁹ Public Information Act (2000): <https://www.riigiteataja.ee/en/eli/522122014002/consolide>.

⁸⁰ Estonian Civil Society Development Concept (2002): http://www.kysk.ee/failid/Upload/files/Estonian_civil_society_development_concept.pdf.

⁸¹ The Good Engagement Practices: <https://riigikantselei.ee/en/supporting-government/engagement-practices>.

⁸² By amending The Response to Memoranda and Requests for Explanations and Submission of Collective Addresses Act (available at: <https://www.riigiteataja.ee/en/eli/501112016001/consolide>) as well as The Parliament Internal Rules Act in 2014.

2.5 Enabling Frameworks: Technical, Legislative, Financial/Budgetary and Organisational Frameworks

2.5.1 *The Technological Framework: the main pillar of Estonian e-governance*

As a recent report by the e-Governance Academy states, there are two magic ingredients of e-governance in Estonia⁸³. In our report, and as stated above, we refer to them as the main building blocks of e-government, i.e. the **Data Exchange Layer X-Road** that forms the backbone of e-Estonia, and the **eID**. As we have seen, the X-Road's creation started already in the late 1990s in order to create a secure and standardised environment for enabling data exchange between different information systems, both in the private and the public sector. Until the present, this critical environment has been running without a single downtime, and all of the Estonian e-solutions that need data from multiple databases use the X-Road. The second main pillar of Estonian e-governance is its **comprehensive system for electronic identification, authentication and digital signature**. Today, around 94% of the Estonian population holds the mandatory ID card that can also be used as a proof of an identity in an electronic environment. All e-solutions provided in Estonia can be accessed using the eID, and the digital signature can be used by anybody in any relation - governmental, business, or private.

Currently, the Estonian government does not plan to move away from the well functioning centralised identity management that is based on the personal identity code. Similarly, the intent is to continue with the Public Key Infrastructure based decentralised identity model, i.e. in which a person is the holder of and responsible for the private key (in Estonia, as mentioned, the certificates are on the ID card).⁸⁴

Besides the technological framework provided by its two pillars – the X-Road and the eID – one should also note the state-run portal www.eesti.ee. This portal has over time become the central point of contact for central and local government digital services in Estonia. It can be accessed by logging in using an eID or mobile ID or, alternatively, via the authentication modes of the bank. It is also the medium through which people can check what kind of data the government stores about them.

2.5.2 *The Legislative Framework: information society policies and supportive legislative acts*

Estonia does not entail a comprehensive system of specialised e-governance legislation, and our findings indicate that e-governance is not strongly regulated. The success of Estonian e-governance does not seem to be based on a well-orchestrated strategic vision that is supported by an extensive legislative framework. Rather, we find that the Estonian e-governance strategic documents have been very short, refraining from going into details,

⁸³ <http://ega.ee/wp-content/uploads/2016/06/e-Estonia-e-Governance-in-Practice.pdf>.

⁸⁴ In 2016, The Ministry of Interior ordered a research on the legal regulations and best practices across Europe in the field of biometric and biographical data-based personal identification and identity verification. The authors of the report (e-Governance Academy, Krabu Group and De Sapiencia) have, among others, recommended not to change the good functioning PKI. See (full report only in Estonian): http://ega.ee/wp-content/uploads/2016/11/Biomeetria_uuring.pdf.

especially until the second half of the 2000s. The first principles for an Estonian information society were adopted in 1998, after the initiation of some major e-governance projects in Estonia (see above) - it is a document of three pages, laying down very general concepts⁸⁵. It essentially is there to serve as a guide for digital transformation to reach its four objectives: improve democracy, advance information infrastructure, support economic development, maintain Estonian language and culture, and modernise government apparatus. The strength of this short document, however, lies in its scope as technology is seen as a driver for a societal change and not put into a narrow context of government information systems. The following strategy for 2004-2006⁸⁶ continues the approach. Since 2007, the strategies have gained in length but, in sum, the success of Estonian e-governance seems not be determined by the formally adopted documents.

Until the present, Estonia does not have a specific e-governance legislation. Instead, Estonia has regulated some of the essential aspects of e-governance such as electronic identification, digital signature, access to electronic information, etc. It clearly tries to avoid over-regulation⁸⁷, while at the same time establishing fundamental principles for the advancement of the information society. This most of important of these principles and the acts are the following:

A) Centralised identity management that is based on a personal identification code that is also used for electronic identification and digital signature (Identity Documents Act 1999⁸⁸; Population Registry Act 2000⁸⁹; Digital Signature Act 2000⁹⁰; and Personal Data Protection Act 2003⁹¹). There are no general regulations about authentication or legal acts which would require defining the hierarchy of different authentication mechanisms. As mentioned, the regulations are usually area specific and tend to be very laconic including the first regulation on the X-Road (2003).⁹²

B) “The once only” principle which means that the public institutions cannot ask for the same information twice (Databases Act 1997⁹³, since 2008 incorporated in the Public Information Act). In practice, it means that if data is already stored in one database, this information cannot be asked again but the multiple uses of these data are guaranteed by the interconnectedness of state databases and information systems via the Data Exchange

⁸⁵ The Principles of Estonian Information Society (1998): <https://www.riigiteataja.ee/akt/75308>.

⁸⁶ The Principles of Estonian Information Society Policy (2004-2006): https://www.mkm.ee/sites/default/files/infopoliitika_pohialused_2004-2006.pdf.

⁸⁷ Several legal scholars have warned over the recent trend of too detailed legislative acts, including in the area of digital developments, in particular in relation to the implementation of the e-residency project (Särav and Kerikmäe 2016).

⁸⁸ Identity Documents' Acts (1999): <https://www.riigiteataja.ee/en/eli/512072016001/consolide>.

⁸⁹ Population Registry Act (2000): <https://www.riigiteataja.ee/akt/1036369>.

⁹⁰ Digital Signature Act (2000): <https://www.riigiteataja.ee/akt/694375>.

⁹¹ Personal Data Protection Act (2003): <https://www.riigiteataja.ee/akt/264800>.

⁹² X-Road Regulation (2003): <https://www.riigiteataja.ee/akt/688079>. The X-Road regulation has been amended twice since: in 2008 (<https://www.riigiteataja.ee/akt/12956835>) to implement the amended Public Information Act and in 2016 (<https://www.riigiteataja.ee/akt/127092016004>) to harmonised the new Directive of the European Parliament and Commission no 910/2014 on Trust Services and eID, adopted on July 23, 2014, p. 73-114, i.e., so-called eIDAS directive (see: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0910&from=EN>).

⁹³ Databases Act (1997): <https://www.riigiteataja.ee/akt/745339>.

Layer X-Road. For a transparent and efficient management of the state's information (and to guarantee that the "once only" principle is respected), there is an administration system for the state information systems RIHA⁹⁴. This catalogue of the state information systems gives information about all state databases and information systems but also on which data are collected and maintained in these information systems, and which services are being provided to whom.

Additionally, the Databases Act (1997) laid down another essential principle for the development of e-governance in Estonia - the principle according to which a person must know the data that the government possesses about him or her.⁹⁵

C) Recognising digital signature as being fully equivalent to hand-written signature (Digital Signature Act 2000).

D) Public information disclosure (Public Information Act 2000⁹⁶). The PIA lists information that has to be made public on the websites of all public institutions. From 2008, it also covers the previous Databases Act. From the perspective of e-governance, the Public Information Act regulates the management of the national information system (RIHA), the data exchange layer X-Road, and the security measures of information systems.

2.5.3 The Financial and Budgetary Framework: limited resources

The main pillars of Estonian e-governance, the eID and the X-Road, were born out of a mere necessity to save costs. During the 1990s and early 2000s, Estonia did not yet have an access to external resources, including the EU Structural and Investment Funds that are now used to finance 85% of the Estonian IT developments.

Despite a moderate budget, the Estonian government has followed a centrally coordinated planning and financing of e-government projects, avoiding costly duplicative developments. Additionally, the sustainability of these developments has been guaranteed by constant (true, modest) state financing, totalling approximately 1% of the annual expenditures since 1994⁹⁷. A limited budget of the Estonian state and, today, the strong dependence on EU structural and investment funds clearly bears some limitations for improvements as the development works rely on the priorities and the financing cycle of the EU. To give an example: the development of cross-border services has been particularly slow, including the cooperation between Estonia and Finland that despite the 2013 agreement has yet to

⁹⁴ Administration system for the state information systems RIHA: <https://www.ria.ee/en/administration-system-of-the-state-information-system.html>.

⁹⁵ The principle according to which people must know what data government possesses has had a twofold role: first, it helped building trust among the public and, secondly, this principle was used as an argument for state institutions to join X-Road.

⁹⁶ Public Information Act (2000): <https://www.riigiteataja.ee/akt/122032011010>.

⁹⁷ Over the years, Estonia's IT budget has constituted 1% of the budget and it was very modest until about 2003. Recently, IT costs have increased considerably, mainly due to the availability of the EU Structural and Investment Funds and, currently, 85% of the IT developments in Estonia are financed from the EU Structural and Investment Funds. The IT costs are presented in the "Information Society Yearbooks" (until 2007, named "IT in Public Administration") prepared by RISO in 1994-2012. These annual volumes give a detailed overview of the IT developments in Estonia, but since 2014, these documents are no longer available to the public, except for the years 2009, 2010, and 2011-2012.

produce tangible results in form of common cross-border e-services⁹⁸. In May 2014, at the time the heads of e-governance of both countries were in Helsinki agreeing on mutual and ambitious e-governance projects, the heads of the department of Information System Authority in Tallinn were debating over the use of their annual budget for 2015 - amounting to a mere EUR 250'000.

2.5.4 The Organisational Framework: centralised policy development, decentralised implementation, collaboration between public and private sector

Estonia's Ministry of Economic Affairs and Communications developed the first principles of the information society and the supportive legislative framework and is also responsible for the supervision of the involved state organisations since 1993. The implementation of the building blocks, i.e., the main toolkit of Estonian e-governance such as the Public Key Infrastructure (PKI), Data Exchange Layer X-Road, State Portal www.eesti.ee, Document Exchange Centre, are also developed and maintained centrally by the Information System's Authority (RIA). Yet, all the other e-government developments such as the development of e-services, information systems etc. are carried out by the responsible government institutions. The official organisational framework has been supported by the several thematic working groups of RISO and RIA, and as importantly, by a strong community network.

Banks, telecommunication companies, and IT companies have played a central role in the development of digital governance in Estonia, and an established cooperation between the private and the public sector can be credited for the success of e-governance. The major banks, i.e. Hansapank and Ühispank (now respectively Swedbank and SEB), have had a significant share in the development of the digital society in Estonia. First, by developing their own electronic solutions and offering high quality e-banking services in 1996 and, more importantly, offering also third party e-services (water, electricity, gas etc.), the banks helped quite significantly in the creation of Estonia's e-society. The promotion of a frequent use of online transactions helped in building trust in the cyber world among the Estonian public that was deliberately used to build trust in public online services ("you trust your money online, you trust your taxes online"). As importantly, the largest public-private partnership project in Estonia to date - "Look@World" - was largely financed by the banks who continued to finance similar public awareness campaigns, including the 2009 Computer Security project that rooted the use of the eID and mID among the Estonian public. Rather surprisingly, Estonia did not have to undergo any heated political debate

⁹⁸ On December 10, 2013, the Prime Minister of Estonia, Andrus Ansip, and the Prime Minister of Finland, Jyrki Katainen, digitally signed the Memorandum of Understanding (see the MoU: <https://adr.mkm.ee/?id=E875770922F8B156C2257C3E00387D36>) with an overall aim to strengthen bilateral cooperation between Finland and Estonia in the area of the ICT developments. In 2014, the X-Road Co-Development Agreement was signed between Estonia and Finland with an overall aim to further cross boarder services between the two countries. It was only in October 2016 that Estonia published the source code of the X-Road central solution (see press release: <https://www.ria.ee/en/the-source-code-for-the-x-road-center-was-published-as-foss.html>) and in November 2016, the two governments agreed to establish an NGO, called Nordic Institute for Interoperability Solutions to execute the 2014 plan (see press release, in Estonian: <https://www.ria.ee/ee/mkm-eesti-ja-soome-asuvad-koos-x-teed-arendama.html>). Currently, there are no cross-border e-services provided (the developments of e-prescription however are under way).

amongst its main actors – and first and foremost among its political parties – with regard to the societal project of collectively going online. A broad consensus reigns in the country reaching beyond parties and into civil society. The only exception here is the introduction of Internet voting. The latter was criticised by the Centre Party to attract the potential votes from those sceptical of the cyber world. Yet, it never manifested itself in any attempt to block passing a relevant legislation, or addressing the issue in any of the party's documents. Our analysis of all party programmes since 1992 shows that only in recent years, has e-government emerged in such documents, mainly from 2011 onwards when all the major developments had already been launched. The only exception is the Social Democrats who already in the 1990s refer to the need to make use of the information society opportunities in building Estonia. Only recently, after the Estonian e-governance received international praise, have some of the political parties started to associate the technological developments with the efforts of their parties, particularly IRL and the Reform Party. Instead, several experts⁹⁹ have emphasised certain decisions that public officials have made throughout the development of e-governance, including some of the key initiatives such as Data Exchange Layer X-Road and the eID. In this respect, a small IT community – a network of IT specialists and government officials – has been crucial in both shaping government policies and regulations but, equally, in the implementation phase.

2.6 Concluding remarks regarding Estonia

The development of e-governance in Estonia has clearly been in the hands of the government who took a strong leadership in placing the Internet and technologies in the centre of the Estonian transformation agenda. By initiating some of the most critical components of Estonian e-governance such as the X-Road and the eID as well as the „Tiger Leap“ programme, the government created an innovation friendly environment but, as importantly, established itself as a reliable and forward looking partner for the private sector. Indeed, it has been a multi-stakeholder effort in which private sector actors have been actively participating both by financing critical public awareness raising campaigns such as the „Look@World“ but also by creating trust, first, in Internet banking and, later, in public online services and the cyber world at large.

The government owns part of the e-governance success to political leaders who have, in consensus, accepted and supported the use of the Internet and technologies as part of the public reform agenda, guaranteeing a modest, yet sustainable financing since the 1990s. A good collaboration between government leaders, politicians, and public officials has been the key to the success of several of the e-governance projects, including one of the backbones of e-governance in Estonia – the eID. The collaboration between different stakeholders but also among government officials has taken many forms, from established working groups to loose networks and communities. The informal collaboration and close ties between the stakeholders, partly possible due to the small size of the country, have been particularly effective in building digital governance.

⁹⁹ From the interviews with Arvo Ott, Mari Pedak, Epp Maaten and Heiko Vainsalu.

The development of digital governance in Estonia has been supported by a well functioning legislative framework. However, instead of a strong e-governance legislation, Estonia has regulated some of the essential aspects of e-governance such as electronic identification, the digital signature, access to electronic information, the “once only” principle and alike. It has tried to avoid over-regulation while, at the same time, establishing fundamental principles for the advancement of the information society. The flexible legislative environment backed up with open minded young public officials collaborating with private sector actors has enabled quick and, at times, brave innovations: the Data Exchange Layer X-Road was implemented within a year whereas it took just three months to launch the information system for government sessions. In recent years though, policy documents and regulations have gained in length and depth as have administrative procedures and the decision-making processes, worrying both legal experts and practitioners alike.

The biggest challenge for Estonia is no longer the one of introducing the Internet and technologies into public administrations or into the public at large. It is the scarce financial resources of the Estonian state, resulting in the overdependence on the EU structural and investments funds, their priorities and financing cycle. Lack of resources has slowed down the progress in the areas of political or governmental concern such as e-participation. It has also slowed down Estonia in recent technological trends in fields such as open data, big data, predictive analytics, artificial intelligence and alike.

3. Switzerland

3.1 Historical overview

3.1.1. First steps: experimentation and pilot implementations

The first steps for the establishment of e-government in Switzerland were taken in the late 1990s. The Internet was emerging as an all-embracing technology and government agencies were discovering its uses for their interaction with citizens. Among the first on-line services offered in Switzerland was the possibility for filling in tax forms, followed by a system that allowed to also electronically submit tax forms to the administration. Other services such as the availability of other forms to print out and fill in manually followed soon, ranging from passport request forms over civil status matters (marriage, childbirth) to business issues. The introduction of government services that require some form of identification followed later. This was characterised by a variety of approaches. Indeed, different solutions are available at different levels of government and between them. Concerning electronic voting, Switzerland was among the first countries that ran pilot tests. The acceptance of remote voting and the related routines were already widespread due to the introduction of postal voting. However, the nationwide introduction of electronic voting has still not been achieved, mainly due to the nature of the very fragmented federal system.¹⁰⁰

3.1.2 Establishing a national e-government strategy

In 2007, the Swiss Federal Council approved the first national e-government strategy, an initial step towards an integrated, nationwide form of e-government.¹⁰¹ The strategy was developed in collaboration between the federal state, the 26 cantons, and the Swiss communes. Over the years, the strategy was continuously revised due to the development of ICTs. One of the five strategic goals of the e-government strategy is innovation and the promotion of Switzerland as an attractive business and living environment. The introduction of electronic government instruments in Switzerland is part of a larger strategy for the information age and is based on the OECD Recommendation of the Council on Digital Government Strategies.¹⁰²

3.1.3 Timeline e-services

Similar to the timeframe in the Estonian case study, we apply a timeline to the introduction of e-services in Switzerland. By doing so, we selected the most salient, visible and used developments. They range from taxation to voting and from policing to parking cars. We do so chronologically and by very briefly describing the goals of the services.

Late 1990s: The first E-tax experiments. First cantons introduced systems to fill in tax forms electronically.

¹⁰⁰ Serdült et al. (2015), Kucera and Aschwanden (2016) and Glaser (2015).

¹⁰¹ For the information on the e-government strategy see *E-Government-Strategie Schweiz* 2016.

¹⁰² *E-Government-Strategie Schweiz* 2016.

1998: The Swiss federal government's "**Strategy for an information society**". Basic guidelines and strategies for the introduction of e-government systems, particularly electronic voting.¹⁰³

2003 E-voting experiment in the municipality of **Anières (Canton of Geneva)** in a municipal referendum. 2004, e-voting was introduced in the entire canton.

2005 E-voting in Zurich and Neuchâtel. Zurich followed the Geneva model (later Consortium for e-voting). Voter identification by letters with access codes to all registered voters, using the postal vote registry. The Neuchâtel system is part of a larger e-government solution with an electronic identification system for all e-services.

2007 Swiss E-Government strategy 2008-2015. Main guideline: The establishment of transparent, efficient, user-friendly and cross-media compatible government services for the wider public, the economy, and public administration.¹⁰⁴

E-health strategy 2007-2015: implementation, establishment of an electronic patient dossier standard, development of national health-related services and information.

2008 General agreement on e-government (Rahmenvereinbarung e-government Schweiz). Implementation of the e-government strategy. Main elements: establishing nationwide e-government standards, establishing security standards, establishment of governing body (Steuerungsausschuss, delegation of politicians), expert council (Expertenrat), and e-government agency (Geschäftsstelle e-government). **Definition of e-health standards:** First definition of e-health standards in Switzerland. **Neuchâtel enables e-voting for expatriate citizens.**

2010 Introduction of **SuisseID**, a standard for electronic identification and document signing is available for individuals and companies doing business in Switzerland. Introduction of the Swiss **standardized health insurance card**. This card and related health insurance number is part of the electronic patient dossier standardization strategy. **Basel Stadt** introduces **e-voting** for both **resident and expatriate voters**, **Zurich** enables **e-voting for expatriates**.

2011 E-voting in Zurich is stopped due to technical problems (see e-voting case study below).

2012 Report on the Swiss e-health strategy. Main success: health insurance card and national standards for treating health data across institutions in a federal country with many private health insurance companies and cantonal systems.

2015 E-voting in Zurich partially resumed. The technical problems of the "consortium system" are partly resolved (see e-voting case study below). However, in the same year, the **Consortium vote électronique dissolved**.

¹⁰³Trechsel and Gasser (2013).

¹⁰⁴<https://www.egovernment.ch/de/umsetzung/e-government-strategie/>.

E-voting for expatriate Swiss in national elections. For the first time, all registered Swiss citizens abroad could participate electronically in the national elections. After the first phase of e-government strategy ended, the national government published the **E-government strategy 2016-2019**. Main topics: harmonization of cantonal e-government solutions, nationwide e-voting for all elections, initiatives, and referendums, and finally, the introduction of a widely accepted and used electronic identification system.

3.2 Main online services and e-participation tools

The main online services and e-participation tools concern different ways of (electronic) interaction: contact of authorities with citizens (G2C), contact of authorities with businesses (G2B), and the contact of authorities with authorities (G2G).

The most used G2C online services by now are the download of different forms (in many government areas spanning from construction to civil status and residence issues). An increasing number of cantonal authorities also offer online submission of filled-in forms, the electronic tax declaration, etc.¹⁰⁵ Satisfaction with online services is rather high.¹⁰⁶

Government-to-business services such as the possibility to register companies or to sign electronically with a government-approved e-identity, or the exchange of patient data between different healthcare institutions are also used, but more sporadically.

Government-to-government services are mainly concerned with the coordination and exchange of data between different government units (e.g. departments/ministries) or levels (federal-cantonal-communal). These services are introduced in many fields, but there are also laws restricting the exchange of information between different government bodies.

3.2.1 Technological perspective and strategies

The Swiss e-government strategy consists of 12 different elements (sub-strategies) displayed in the table below:¹⁰⁷

| Project | Topic |
|-----------|---|
| eUmzug.ch | Digital moving: changing addresses, changing inscription in communal registers in case of moving houses |

¹⁰⁵ A detailed list of e-government services is found in the appendix. For the citizen satisfaction with e-government services in Switzerland, Germany, and Austria see (ipima Institute for public information management & Initiative D21, 2016).

¹⁰⁶ E-Government Monitor 2016: <https://www.egovernment.ch/de/dokumentation/controll/#egovernment-monitor-2016>.

¹⁰⁷ The list of instruments and topics is derived from the information on the e-government website, explanations and grouping of topics by the authors. (see <https://www.egovernment.ch/de/umsetzung/schwerpunktplan/>).

| | |
|--|--|
| Identitätsverbund Schweiz | Nationwide e-identification tool for contacts between citizens and public administrations |
| Electronic identity | Design and implementation of an internationally valid digital identity |
| Validator für digitale Urkunden | Design and implementation of a tool for the validation and signing of official documents |
| eOperations Schweiz | ICT-cooperation within and between Federal government offices and cantons (organising committee and cantonal-federal collaboration) |
| Vote électronique | Establishing Internet voting in the entire country (for both popular votes and elections at all levels of the federal state) |
| Transaction portal for business | Transaction portal which provides the online services of the federal state, the cantons and the communes for contacts and matters between companies and public administrations |
| Electronic reporting of VAT | Establishment of a system that allows companies to submit VAT returns electronically |
| Access to electronic government services for the general public | Implementation of technical solutions and systems to enable electronic government services for the general public in many policy areas |
| Technical coordination with public bodies | Technical coordination |
| Standardisation maintenance | Enabling and maintaining the technical standardisation of e-government services |
| Coordination in legal questions regarding e-government | Knowledge transfer on legal issues regarding e-government |

These sub-strategies touch different fields of technological, social, political, economical and legal expertise. From a technological point of view, the establishment of a national e-government strategy tries to provide unified standards for e-government that should be implemented at the federal level and in the cantons and municipalities.

The 2017-2019 strategic plan sets goals regarding the e-government implementation sub-strategies shown in the table. One large part of the strategy is dedicated to technological harmonisation of different e-government solutions that are already implemented in the cantons. Another part is the introduction of nationwide electronic voting as well as the introduction of e-identification tools for the different purposes and subfields mentioned in the table.

3.3 Case study: Electronic tax declaration

The electronic tax declaration could be seen as the first and most successful introduction of an e-government application in Switzerland. By 2016, some form of electronic tax declaration is standard in all Swiss cantons. However, not all cantons have yet introduced e-tax systems that use electronic identification or barcodes.

While there are national standards related to tax declarations, the individual cantons and municipalities are using different technical solutions. Some of these are developed by the state, whereas others are developed by private companies.¹⁰⁸ The extent of services offered by the cantons also differ¹⁰⁹: Some, mostly the larger cantons offer more sophisticated possibilities for filling in and submitting tax declarations for different user types (companies, private persons, organisations, etc.). Other, mostly smaller cantons provide less sophisticated systems, e.g. the download of forms in excel format (e.g. UR, AR) without the possibility to submit the forms electronically. The more sophisticated systems are either specific solutions only for handling tax forms, or integrated solutions which provide not only tax services, but can be used for a wide range of other services.

However, most e-tax systems still work with identification barcodes on papers that are sent to the individual taxpayers by mail (because tax forms have to be signed manually if there is no electronic signing technology). Some cantons have introduced electronic identification with Suisse ID, the electronic signing system developed by the Swiss Post (e.g. ZH, experimental phase in some municipalities).¹¹⁰

The idea to provide electronic solutions to fill in tax forms seems to have arisen rather naturally from the fact that many people and particularly companies already used some kind of electronic tax form in the late 1990s, e.g. excel tables or particular software solutions for filling in tax forms (e.g. Dr. Tax by Ringler Informatik AG).¹¹¹ Starting with initiatives of some private companies, and after some initial scepticism from the public side, cantonal tax authorities began to implement electronic tax form reading instruments around the year 2000. This technology allowed for an easier procedure of tax declarations by the public authorities. Tax-form software and online tax forms were developed during the early 2000s and implemented in the larger cantons. Many smaller cantons (with less financial resources for public administrations) do not yet have electronic tax form systems with barcode or e-identity identification.¹¹² However, according to the national e-

¹⁰⁸ Egovernment.ch provides a list of all systems in use with additional information on the type of software, type of national standards used in the software, places of implementation, and provided services (e-government.ch, 2016, see List in appendix).

¹⁰⁹ The information for this section is taken from the egovernment-landkarte.ch database and cantonal websites.

¹¹⁰ <https://www.suisseid.ch/de/news/zurich-testet-online-steuererklärung-login-mit-suisseid>.

¹¹¹ Ringler Informatik AG, one of the companies that later becomes the leader in offering e-tax software in Switzerland provides historical information on e-tax: <http://www.ringler.ch/unternehmen-geschichte.php>.

¹¹² A map of the cantons that have implemented e-tax for individual citizens is available at: <http://www.egovernment-landkarte.ch/#/service/30/available-online/map>.

A detailed list of municipalities and cantons that have implemented e-tax instruments is available at: <http://www.egovernment-landkarte.ch/#/service/30/details>.

government strategy, they are planning to introduce such systems soon, together with the implementation of a wider range of e-government services for citizens and companies.

In the case of e-tax, there is not much to report in terms of pro and contra arguments. If the level of data security is high enough, which seems to be the case in Switzerland, then the user-friendly way to hand in tax forms is welcomed by most people. On the government side, too, e-tax makes the administration of tax forms more efficient as there is less need to decipher difficult hand-written tax forms, and more of the data is already present in electronic format.

E-tax or electronic tax administration is likely to be the first and also largely successful implementation of an e-government service in Switzerland. Beginning with rather simple solutions such as providing tax-form templates and instructions on cantonal websites, e-tax has grown into an e-government service enabling the electronic submission of tax forms and on the public office side, the electronic processing of taxpayers' information. Moreover, this service is used as an environment to implement and test new e-government technologies, particularly e-identification technology. E-tax is also widely accepted by the population and tax-paying companies and other legal persons.

3.4 Case study: Internet voting

As mentioned above, Switzerland was among the first countries to experiment with electronic voting systems, profiting from the prior introduction of postal voting.¹¹³ However, as explained in this section, the introduction of e-voting in Switzerland is a slow process, facing many difficulties. At the present time, there is a national strategy for the introduction of electronic voting, first for Swiss residents abroad, and in a second step, for local residents (egovernment.ch).

Swiss e-voting began with a pilot introduction in three cantons: Geneva, Neuchâtel, and Zurich, using different software systems. Geneva and Zurich used a specific e-voting solution that was separate from other e-government applications or online forms. In the first case, it was hosted by the canton (Geneva system), while in the latter case, the system was hosted by a private company (consortium system). The access data were sent by post to the voters using the same procedure as for postal voting and hence, no prior registration was needed. Neuchâtel used an integrated approach and added the e-voting application to an e-government portal that also allows for other government services (Neuchâtel system).¹¹⁴ The Geneva system of Internet voting was continuously used since its inception, whereas the Zurich project was stopped in 2011 due to technical problems,¹¹⁵ These

¹¹³ An overview of the introduction of electronic voting is provided by Trechsel and Gasser (2013), for the legal framework see also Glaser (2015) and the documentation on egovernment.ch. See also Auer and Trechsel (2001) for some of the first considerations; Christin & Trechsel (2005); Gerlach & Gasser (2009).

¹¹⁴ Trechsel and Gasser (2013).

¹¹⁵ Trechsel and Gasser (2013).

technical problems were not related to data safety, but to the interfaces between municipal vote registries and electoral management systems.¹¹⁶

After these initial tests and in the context of the Swiss e-government strategy, the goal was set to introduce Internet voting for all Swiss citizens living abroad. By 2015, 12 out of 26 cantons allowed their citizens living abroad to vote electronically (Serdült et al., 2015). However, in October of 2015 the “Consortium Vote électronique”, bringing together nine cantons, did not obtain the authorisation by the Federal government to offer Internet voting in view of the federal elections of November 2015. Underlying this decision were security concerns related to the secrecy of the voting act.¹¹⁷ This was the end of this consortium. Only four cantons (GE, LU, BS and NE) were given the opportunity to offer Internet voting for their citizens abroad in the federal elections of 2015.

Since the disaster of 2015, Internet voting continued to be offered in these cantons as well as in the canton of Berne. In addition, the canton of Fribourg, formerly part of the consortium, opted for the e-identification solution offered by the Swiss Post, and through this approach now also provides for Internet voting.¹¹⁸ At the end of 2016, electronic voting is therefore offered in the cantons of Geneva, Berne, Basel City, Lucerne, Fribourg and Neuchâtel, mainly for expatriate voters, but in Geneva, Neuchâtel and Basel also for a part of the resident population (see map below).¹¹⁹

Similar to the other fields of e-government, there is a specific roadmap for the introduction of electronic voting in Switzerland. The goal is to introduce e-voting in the entire country by 2020.¹²⁰ In our view, reaching this goal will be very difficult. The support for the quick introduction of e-voting comes from federal actors and the interest organisations of cantons and municipalities, as laid out in the e-government agenda. The political opposition to e-voting seems to be centred in the small cantons in central Switzerland: some cantonal governments are afraid of the costs of the introduction of e-voting, security issues related to vote manipulation, and fear that their cantonal sovereignty is diminished by the introduction of a supplementary competence given to the federal level.¹²¹

Looking at public opinion towards Internet voting in Switzerland, the latter is clearly favourable – mainly for reasons of convenience. In particular organised interests of Swiss citizens residing abroad are constantly demanding for a quicker implementation of Internet voting.

2015, when the Consortium Vote électronique was dissolved, e-voting in Switzerland was not in a good state. Serdült et al. underline that the slowness of the process is similar to the introduction of postal voting, which took almost 20 years to become generalised.¹²²

¹¹⁶ Serdült, Germann, Mendez, Portenier, and Wellig (2015, p. 127).

¹¹⁷ Hehli (2015).

¹¹⁸ <https://www.bk.admin.ch/themen/pore/evoting/index.html?lang=en>.

¹¹⁹ Info vote électronique Summer 2016, found at:

<https://www.bk.admin.ch/themen/pore/evoting/index.html?lang=en>.

¹²⁰ *E-Government-Strategie Schweiz* 2016.

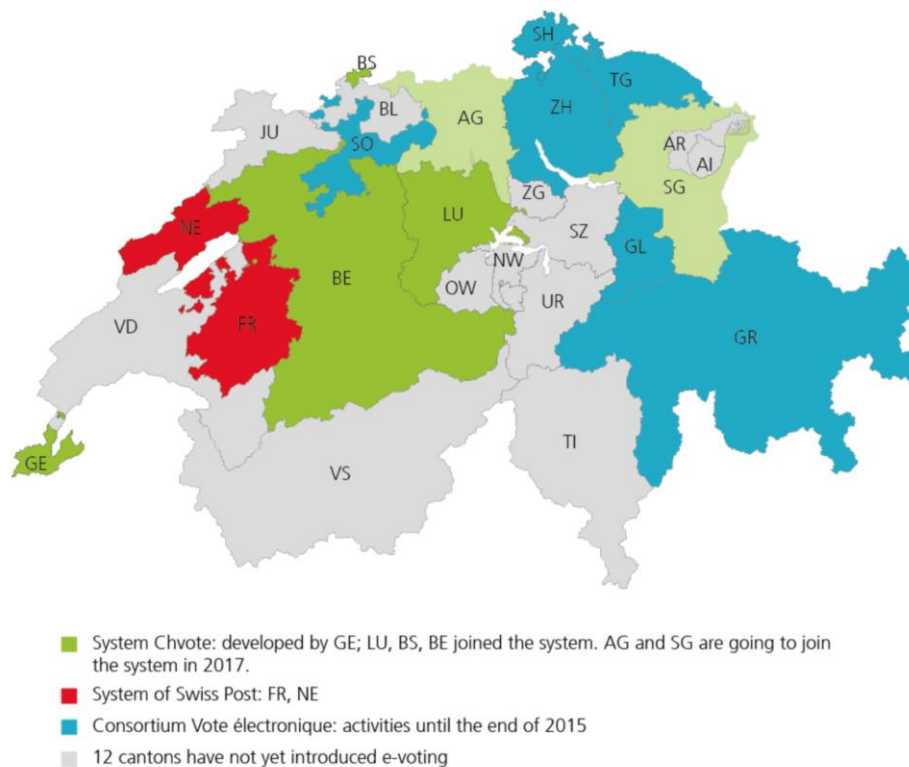
¹²¹ Kucera and Aschwanden (2016).

¹²² Serdült et al. (2015, p. 126).

The recent re-emergence, however, of Internet voting systems related to broader e-government solutions raises some observers hopes. However, some fundamental factors continue to hinder the development of Internet voting in Switzerland, which has now taken over 16 years and did not really go far. These factors include security concerns, economic factors, the integration with other e-government applications and standards, and the difficulty to find a solution that fits most cantonal and national (and municipal) electoral systems and regulations.¹²³

When it comes to security concerns, some promising technological developments should be followed most closely. In particular blockchain technology is currently seen as a potential saviour of secure electronic voting.¹²⁴ However, the technological possibilities that are promised by blockchain solutions will not be sufficient. Unless there is a political will to coordinate efforts instead of producing competing solutions, Internet voting will not be offered to the Swiss citizens irrespectively from their cantonal residence by 2020. It is often claimed that the federal structure of Switzerland allows for experimentation, and that is most certainly true. However, it may also lead to some kind of permanent experimentation, paradoxically unable to overcome the hurdles put in place by the very organisational form of the state that allowed for the experimentation in the first place, i.e. federalism.

Figure 2: *Map showing the introduction of different e-voting methods in 2016 (e-government.ch, 2016).*



¹²³ For the problems related to e-voting in 2016 see Kucera and Aschwanden (2016).

¹²⁴ <http://blog.wecollect.ch/blog/blockchain-neuer-schub-fur-e-voting-in-der-schweiz>.

3.5 Case study: Electronic identity

The more e-government services were developed, the clearer it became that the introduction of some kind of electronic identity and signature became indispensable. Electronic identification can also be used in a myriad of other contexts and on-line services, from filling in online lottery tickets to (electronically) signing legal documents or contracts.

Already in the initial phase of the development of e-government services, e-ID systems were mentioned and indeed planning an electronic identification system began in the early 2000s.¹²⁵ The 2002 report on Internet use in Switzerland already mentions some of the aspects that would need e-identification for political applications.¹²⁶ In 2003, the Federal Parliament adopted the Federal Law for the introduction of an electronic identity.¹²⁷ The Swiss e-government-strategy does not directly mention the development of an e-ID standard, but in subsequent strategy documents some more detailed plans for the introduction of a nationwide e-ID system by 2020 were laid down.¹²⁸

By 2016, SuisseID, introduced in 2010, is the standard for electronic identification and document signing.¹²⁹ The Swiss electronic identity is, however, still not free of charge. It has to be obtained through the SuisseID website or several private companies.¹³⁰ The user-friendliness of the SuisseID system was frequently criticised.¹³¹ However, currently, there are plans to distribute SuisseID as a free feature for all Swiss residents.¹³² Moreover, Swisscom, UBS and Credit Suisse are planning to introduce an alternative e-identification tool soon.¹³³

Besides SuisseID, in 2015, the Swiss Federal Railways (SBB CFF) have introduced an electronic transport card (Swisspass).¹³⁴ This card is used for public transport subscription cards and can also be used, for example, as access key for a car sharing system or for skiing passes. In the medium term, there are plans to add a public transport ticket service to the card, similar to the Dutch OV-chipkaart and the London oystercard.¹³⁵

In addition to these private or public-private e-ID projects, the Federal Council has mandated the Federal Department of Justice and Police (EJPD) to develop an official

¹²⁵ Huber et al. (2002).

¹²⁶ Trechsel (2002).

¹²⁷ <https://www.suisseid.ch/de/page/faq>.

¹²⁸ <https://www.egovernment.ch/de/umsetzung/schwerpunktplan/>. A detailed summary and the discussion of the current strategies for the Swiss e-ID is found in the 2015 government report on electronic identity. This report presents the result of several stakeholder workshops (Weber et al., 2015).

¹²⁹ <https://www.suisseid.ch/de/suisseid-die-sichere-digitale-identitat-im-internet/einfuehrung-anbieter>.

¹³⁰ <https://www.suisseid.ch/de>.

¹³¹ http://www.itmagazine.ch/Artikel/63103/Naechstes_Jahr_erscheint_eine_neue_SuisseID.html and Raths (2015).

¹³² http://www.itmagazine.ch/Artikel/63103/Naechstes_Jahr_erscheint_eine_neue_SuisseID.html.

¹³³ http://www.itmagazine.ch/Artikel/63625/Swisscom_UBS_und_Credit_Suisse_entwickeln_SuisseID-Alternative.html?google_editors_picks=true and Brouzos (2016).

¹³⁴ Gmür (2015).

¹³⁵ According to a Dec. 2016 newspaper article, the Swiss Post and SBB are even planning to use Swisspass for the new national e-ID system (<http://www.blick.ch/news/wirtschaft/post-und-sbb-machen-gemeinsame-sache-swiss-pass-wird-zur-digitalen-id-id5904337.html>).

electronic identification system. Different to other countries, where such an identification feature is linked to official identification documents containing RFID chips such as identity cards or passports, the Swiss e-ID strategy plans to provide a standard and no direct link to official documents.¹³⁶ However, according to the EJPD, this new standard will be compatible to EU e-ID standards.¹³⁷

Similar to the current SuisseID, the planned Swiss e-ID will be used for all kinds of interactions: citizen to company, citizen to government, or company to company.¹³⁸ Moreover, another e-government project seeks to enable a standard for all bureaucratic procedures related to moving within Switzerland (eUmzug.ch). This project involves many different government agencies from different levels and will also be facilitated by a national e-ID standard.¹³⁹

As mentioned above, the Swiss approach to e-ID is not an addition to the national identity cards and it is not planned that the e-ID will be issued by government agencies (as is the case with passports and similar documents).¹⁴⁰ According to the EJPD, the main advantage of such a system is the flexibility in the development, whereas a purely state-issued e-ID system might be too expensive and inflexible.¹⁴¹ Moreover, it would be possible to integrate such an “open” system with other electronic identification systems that are already in use such as the public transport subscription card “Swisspass” and the current e-ID SuisseID.¹⁴²

It goes without saying that in order to be accepted by the wider population, an electronic identification system has to be user-friendly and secure. In the course of the introduction of the Swisspass travel card, there was a media debate on transparency and the control of personal data.¹⁴³ Consumer organisations fear the collection of data on personal transportation profiles without legal basis.¹⁴⁴ Similar objections regarding privacy were also made in the context of SuisseID, but according to a 2010 assessment of SuisseID, the level of privacy is rather high: the identification system is not linked to national identification numbers such as the passport or the social security number, and one person could obtain several SuisseIDs.¹⁴⁵ According to some initial security tests, the main source of insecurity

¹³⁶ Waldner, Good, and Müller (2016).

¹³⁷ Waldner et al. (2016).

¹³⁸ For a detailed description of the e-ID features see <https://www.egovernment.ch/de/umsetzung/schwerpunktplan/>.

¹³⁹ <https://www.egovernment.ch/de/umsetzung/schwerpunktplan/>.

¹⁴⁰ Waldner et al. (2016).

¹⁴¹ Waldner et al. (2016).

¹⁴² Waldner et al. (2016), <http://www.blick.ch/news/wirtschaft/post-und-sbb-machen-gemeinsame-sache-swiss-pass-wird-zur-digitalen-id-id5904337.html>.

¹⁴³ See e.g. <http://blog.tagesanzeiger.ch/politblog/index.php/64873/tod-und-hass-dem-swisspass/>, <http://www.srf.ch/news/schweiz/nach-swisspass-kritik-sbb-loescht-kontrolldaten>, <https://www.konsumentschutz.ch/tag/swisspass/>, http://www.tageswoche.ch/de/2016_35/schweiz/728230/.

¹⁴⁴ <http://www.blick.ch/news/wirtschaft/post-und-sbb-machen-gemeinsame-sache-swiss-pass-wird-zur-digitalen-id-id5904337.html>.

¹⁴⁵ More details to the 2010 security check are found on https://www.spirit.bfh.ch/de/archiv/hitech_12010/suisseid.html, and regarding the newest SuisseID developments, Waldner et al. (2016).

regarding SuisseID is not the SuisseID system itself, but hard- and software that is used for any of the services that need SuisseID identification.¹⁴⁶

Currently, electronic identification standards in Switzerland are still not as widely used as they could be, even though Switzerland was an early mover in establishing some kind of electronic identity certification. Similar to the other case studies, the complex nature of the Swiss political system on the one hand, and the many stakeholders and companies involved in the e-ID introduction on the other are both factors that have limited the quick introduction of a user-friendly and widely accepted e-ID.¹⁴⁷ As with Internet voting, blockchain solutions are currently developed in order to solve some of the problems with e-identities. This is most certainly one of the most interesting spaces to be watched in the near future.

3.6 Case study: E-health

E-health, the use of ICT in health care to coordinate all involved institutions and to implement standardised electronic patient dossiers, is a challenge for modern healthcare systems. The Swiss healthcare system consists of a) a mandatory basic healthcare insurance that is provided by private insurance companies, as well as additional insurance models, b) of cantonal and private hospitals and other large healthcare institutions, and c) of other stakeholders such as doctors, nursing and caring at home services, and pharmacies. All these actors may, potentially, be included in a modern e-health system. According to eHealth Suisse, the coordination office of the federal state and the cantons for e-health in Switzerland, despite good technological, financial and social resources, the country is still behind in the development of e-health instruments.¹⁴⁸

First considerations regarding the possible role of ICTs within the Swiss healthcare system came about during the early 2000s. In 2007, the ministry of health (Bundesamt für Gesundheit BAG) published its e-health strategy for the years 2007-2015.¹⁴⁹ The strategy has three main elements: 1) the implementation of the strategy, 2) the development of an electronic patient dossier (including standards and coordination of all stakeholders), and 3), the development of national online services related to health topics. E-health services are expected to lead to more efficiency in many healthcare-related fields: Administration, information, consultation, diagnosis, medical prescriptions, referrals to medical specialists, therapy, patient monitoring, accounting.¹⁵⁰ Since then, several implementation attempts saw the light of day.

In 2012, the first report on the e-health strategy was published, measuring the progress of the implementation of the strategy until the years 2008-2009 (Swiss2012).¹⁵¹ One of the main successes of this first period of e-government in the health sector was the

¹⁴⁶ <http://www.pctipp.ch/news/sicherheit/artikel/security-analyse-suisseid-birgt-gefahren-53327/>.

¹⁴⁷ Hirter, Braun, Langhart, and Gmünder (2016).

¹⁴⁸ <http://www.e-health-suisse.ch/grundlagen/index.html?lang=de>.

¹⁴⁹ Bundesamt für Gesundheit BAG (2007).

¹⁵⁰ Bundesamt für Gesundheit BAG (2007).

¹⁵¹ eHealth Suisse (Koordinationsorgan Bund-Kantone), 2012.

introduction of a standardised health insurance card (albeit only in 2010), a rather complex task in a country with many concurring private insurance companies.¹⁵² Further elements implemented in the first phase include: a) *technical standards* (e.g. standards for electronic patient dossiers, secure authentication and electronic signing standards, definition of quality standards for e-health services), b) *political strategies* such as the creation of a national e-health coordination board (eHealth Suisse) or the definition of the stakeholders' positions regarding e-health, and c) the inclusion of e-health instruments and information in the *education of healthcare professionals*. However, not all planned measures were implemented by 2012, and according to the monitoring report, those that were most difficult to realise were also those where there was a clear need to *coordinate private and public stakeholders* at and across different government levels.¹⁵³

Many of the developments of the first phase concerned primarily technical issues and the sphere of healthcare professionals, i.e. individual nurses, doctors, but also healthcare organisations such as hospitals, insurance companies, pharmacies, or nursing homes. The only element that is immediately visible to patients or better, the entire population, is the standardised insurance card.

Today, Switzerland is in the second phase of the introduction of e-health standards and a new e-health strategy is developed. The core element of this new strategy is the empowerment of citizens, i.e. enabling people to take their healthcare needs into their own hands with the help of e-health instruments ("e-health literacy").¹⁵⁴ Challenges include: big data technology, self-monitoring, privacy, the convergence of data from different sources, monitoring and benchmarking to control health care costs and many more.¹⁵⁵

Whereas the first phase of e-health introduction was mainly centred around establishing standards for communication and data management within and between public and private healthcare institutions, the second phase seems to have two main parts: an educative part which concerns school curricula more than technical developments, and a second part which is a further development of the standards introduced in the first phase and the adaption to new developments such as the big data trend.

The main advantages of e-health are thought to be: higher efficiency of patient information treatment, better coordination of actors involved in the treatment, better cost-efficiency of the (expensive) Swiss healthcare system, and easier and more efficient accounting. Concerning the disadvantages, during the first phase of standardisation, media discussed e-health mainly in the context of data security and privacy, i.e. the fear that too many actors may know too much about an individual.¹⁵⁶ Still today, privacy and data protection seem

¹⁵² eHealth Suisse (Koordinationsorgan Bund-Kantone), 2012.

¹⁵³ "Ziele, die von der Aktivität anderer Akteure abhängen, sind nur teilweise oder gar nicht erreicht. Dies betrifft jene Ziele, die sich an Kantone, Leistungserbringer, Versicherer oder Bildungsanbieter wenden. Der Grund dafür ist, dass die Strategie nicht „aus einer Hand“ umgesetzt werden kann. Die Entscheide im Koordinationsorgan „eHealth Suisse“ haben keine Rechtskraft, sondern sind lediglich Empfehlungen." (eHealth Suisse (Koordinationsorgan Bund-Kantone), 2012, p. 8).

¹⁵⁴ Schweizerische Gesellschaft für medizinische Informatik (2015).

¹⁵⁵ Schweizerische Gesellschaft für medizinische Informatik (2015).

¹⁵⁶ See newspaper article collection on <http://www.e-health-suisse.ch/aktuell/00069/index.html?lang=de>.

to be the most discussed topics regarding e-health: There is also a certain fear that some patient groups, particularly the elderly, might be excluded from the electronic healthcare system (“digital analphabets”) or that patients might not be aware of the importance to treat health data with caution.¹⁵⁷

Notwithstanding articles pointing out the risks and difficulties of e-health, according to e-health Suisse, there is a broad consensus regarding the opportunities to introduce e-health instruments.¹⁵⁸

As in the other case studies, the federal system with its strongly developed cantonal autonomy slows down the introduction of e-health instruments and the creation of national standards. Moreover, the Swiss health insurance system with many private companies brings in additional actors in the already complex stakeholder system.¹⁵⁹

The introduction of e-health in Switzerland seems to follow the path of many e-government elements: It is slow, but steady, and finally, a rather robust national standard is implemented. However, the process of achieving this standard might not have met the criterion of financial efficiency and could have been rather costly. More interestingly, the working paper lining out the second phase of the Swiss e-health strategy shows that Swiss e-health developments are currently in a rather open phase. This includes the idea to develop new instruments for “e-health literacy” among patients themselves and the adaptation of e-health instruments to new trends (mainly big data and self-monitoring). All of these topics bear opportunities for new developments and ideas.

3.7 Country resumé

The development of Swiss e-government is in a continuous dilemma between national strategies versus regional possibilities and innovation. This dilemma, however, can be solved with good national coordination instruments and e-government strategies. In the federal system, regional solutions could serve as ideal “laboratories” for the implementation of new e-government solutions that might eventually lead to very robust solutions that have high acceptance rates among citizens. However, the downside of this approach is the slowness of the process.

Swiss political parties and interest groups take different positions regarding e-government instruments. There is a broad political consensus that security is a core issue when it comes to developing e-government instruments. However, the security argument does not lead any of the main political parties to assume a position against many e-government instruments.

Concerning the four cases studied in this report, there is an almost universal consensus on the usefulness of e-government instruments in the first case, e-tax. This is similar with regards to the second case, e-voting: Political parties seem to sustain e-voting, but there

¹⁵⁷ Well, tablet computers might be the solution in this case, see Dietschi (2016).

¹⁵⁸ <http://www.e-health-suisse.ch/fag/00045/?lang=de>.

¹⁵⁹ See e.g. the structure of e-health Suisse: <http://www.e-health-suisse.ch/organisation/00103/index.html?lang=de>.

have been major difficulties in its development and scaling. In the case of e-identity, there seems to be more political opposition, mainly from consumer interest groups and actors fearing too much transparency and a decline in privacy. There are similar arguments considering privacy in the debate concerning e-health. Moreover, the introduction of e-health is parallel to other political debates concerning the Swiss health-care system, e.g. the debate whether there should be a public basic health insurance. In this debate, the political parties of the left and right have very different positions.¹⁶⁰ Therefore, these debates might influence the political parties' and interest groups' positions concerning e-health.

Regarding the legal framework, the legal bases for the implementation of Swiss e-government strategies are similar to those of other countries.¹⁶¹ The federal nature of the Swiss political system means that besides the national framework, there are also 26 cantonal frameworks. For a large part, these frameworks have already been developed. Federalism does not only lead to a multiplication of frameworks, it also enables experimentation in small-scale environments and competition of different e-government solutions, as seen e.g. in the establishment of e-tax instruments and even more so, the pilot phase of Internet voting. This "experimental playground" advantage also enables projects such as the Zug "crypto valley" strategy.¹⁶² Regarding e-voting, Gasser and Trechsel state that the advantage of the Swiss approach is the possibility to test and introduce different systems. At the same time, and as has become painfully visible by now, federalism also bears some of the highest hurdles for an efficient, nationwide implementation of e-government and e-democracy solutions such as Internet voting.¹⁶³ Further challenges of e-voting systems, and, as the case studies show, also of other fields of e-government, are related to transparency and security.¹⁶⁴ In a complex environment security issues more often than not become a crucial factor in the development (or non-development) of solutions. Put briefly, the Swiss approach to e-government with its multitude of different solutions and applications, might, at the end of the day, be less efficient and less convincing than solutions found in more strongly centralised and coordinated contexts.

¹⁶⁰ There has even been a referendum on public basic health insurance in 2014. The establishment of a national public health insurance was refused by 62% of the voters.

¹⁶¹ E.g. Germany: Gesetz zur Förderung der elektronischen Verwaltung or France: Ordonnance n° 2005-1516 du 8 décembre 2005 relative aux échanges électroniques entre les usagers et les autorités administratives et entre les autorités administratives. For more information on OECD e-government legal frameworks see EC e.government fact-sheets at https://joinup.ec.europa.eu/community/nifo/og_page/egovernment-factsheets.

¹⁶² See e.g. <https://joinup.ec.europa.eu/community/epactice/case/zug-accepts-bitcoin-payments-attract-more-fintech-companies>, (Leisinger, 2016), (Aschwanden, 2016; Sander, 2014). Zug is among the first places in the world to allow for Bitcoin payments in cantonal authorities.

¹⁶³ Trechsel and Gasser (2013).

¹⁶⁴ For e-voting and security issues see Trechsel and Gasser (2013, p. 56).

4. Comparing Estonia and Switzerland

4.1 Historical overview

The visualisation of the e-government timeline shows the main difference between the two cases: Both countries are rather early starters in implementing first e-government services. However, Estonia takes up a much faster pace and introduces more services at an earlier point in time, whereas Switzerland is slower in introducing e-government services. A closer look also shows that many e-government services in Switzerland are only introduced at the regional (cantonal) level and, above all, only in some cantons but not in all of them. Estonia has thus opted for a very national-focused strategy, whereas the federal set-up of Switzerland led to strongly decentralized strategies. For sure, the Swiss strategy is in many areas also led by the federal level of government, partly in reaction to developments that are proposed by supra-national actors, such as the EU, by cantonal and local actors as well as demands from civil society and the private sector.

In the following, we will discuss the advantages and disadvantages of the two different models of introducing e-government services more deeply.

4.2 In-depth comparison

4.2.1 E-tax

In both countries, electronic taxation was among the first e-government services that were introduced and widely used. In Estonia, these services were soon integrated into the nationwide e-identity system, so electronic signing and verification procedures are already implemented. In Switzerland, on the contrary, there is a multitude of different e-tax systems in use, and very few of them use electronic identification technology. The main reason for this lies in the fact that there is not yet a widely used e-ID system even though some cantons permit the use of SuisseID. Most identification is still done by printed barcodes on original tax forms that are sent to the households, and that have to be signed manually.

In both countries, the introduction of e-tax did not face much political opposition. It can be seen as an almost classic example of a procedure that leads towards a more user-friendly system.

The e-tax case studies show that there is still some room for adjustments in the Swiss case, particularly regarding electronic identification and the implementation of e-tax services in all cantons, whereas in Estonia, the e-tax system is more or less completely implemented and working.

4.2.2 E-voting / e-democracy

Since 2005, electronic voting is available to all Estonian citizens having an electronic identity card, and the Estonians have an experience of several elections using e-voting. By contrast, in Switzerland electronic voting is only available to a small minority of citizens (mainly

expatriates), and identification is mostly done by codes sent to the voters by postal means. Our case studies show that this difference is mainly caused by the differences of the institutional environment: In Estonia, the electronic identity was the fundamental element of all subsequent e-government innovation. In Switzerland, such a base was (and is) still missing, and the e-voting systems tested and implemented so far are based on several different e-voting experiments with different structures. There is still no national standard or widely applied e-voting system, even though an introduction of such a system was planned for the first phase of the Swiss e-government strategy (2008-2015).

Switzerland was among the first countries to test e-voting systems at the regional level. This was facilitated by the high degree of local autonomy in the federal state, combined with a strong tradition of postal voting and local voters' registers that enable to send out information to all voters in a constituency. The first e-voting experiments did not encounter major opposition, also due to the fact that voters were used to voting at home. However, since the beginning, one of the major questions was related to the role of the state in voting. While in Estonia the system was state-developed, the Swiss experience often involved private vendors that proposed solutions.

Estonia has introduced various tools for e-participation and detailed internet-based information on parliamentary debates and decisions. Such systems are less developed in Switzerland, even though they might facilitate e.g. the collection of signatures for popular initiatives and referendums. The current lack of a universally used electronic identification system does not encourage the development of such applications.

The e-voting case studies reveal the impact of different political systems. Pioneering Switzerland is now stuck in various development and adjustment difficulties that are attributed amongst others to the political system. At the same time, Estonia has a functioning e-voting system that relies on the electronic identity card. Moreover, there are also many other means of e-participation in Estonia, whereas in Switzerland, such features are not (yet) used. Note that the lack of e-participation in Switzerland is somewhat compensated by the very strongly developed direct democratic tradition at all levels of the federal state – one could argue that fostering citizens' participation in Switzerland is less important than in contexts, such as in Estonia, where citizens are only rarely asked to take an electoral decision at the polls. However, one can also argue, and we adhere to this argumentation, that it is precisely in contexts where citizens are strongly involved in democratic decision making that “going e-“ makes a large difference.

4.2.3 E-identity

At the beginning of the development of e-government, the strategies of Estonia and Switzerland were surprisingly similar regarding electronic identification: In both countries, it was perceived as a core pillar of e-government. However, whereas Estonia was the pioneering country to introduce an electronic identity card, Switzerland soon lagged behind. In Switzerland, SuisseID came out as the main electronic ID service, but it is not widely used. In our view, and looking at the Estonian experience, the development and implementation of a country-wide e-identity strategy is quintessential for the future development of both e-government and e-democracy services and opportunities.

4.2.4 E-health

The main difference between the two countries, Estonia and Switzerland, is concerned with the organisation of the healthcare system.

The Estonian healthcare system is based on a national Health Insurance Fund (Eesti Haigekassa), whereas the Swiss healthcare system is a complicated network of private insurance companies, a national health insurance standard that these companies have to offer to all residents, and additional private health insurance plans. Moreover, hospitals in Switzerland are both cantonal and private. Estonian e-health systems were mainly developed along the introduction of e-identity and e-government services.

As with the other e-government services described above, the Swiss e-health system developed at a slower pace. However, the national e-health strategy and the collaboration between private and public actors seem to be working rather well. Standards for patient data treatment were introduced together with the health insurance card, and are implemented in hospitals, but not necessarily in medical doctor's practices, because many of them still use paper patient dossiers.

4.2.5 Success factors

Among the factors that enable the successful introduction of e-government instruments, several stand out: First, there has to be a clear legal framework that is open enough. The Estonian case (and partly also the Swiss) shows that open legislative structures which do not over-define technological details are useful for the development of successful e-government. However, what also seems to be important regarding legislation is a clear structure that mentions the core elements of e-government: electronic identification, digital signature and a mandate to develop e-government instruments.

A second important factor is political consensus. As shown by the introduction of e-tax instruments in both country cases, and more specifically, by the history of e-government in Estonia in general, if there is no significant opposition, e-government instruments are implemented much more smoothly and are widely used. The absence of partisan, political conflict is therefore an accelerating factor in the development of e-government initiatives.

A third important factor is user friendliness. If e-government applications are easier to use than traditional forms of communication and administration, then the diffusion after an initial testing phase is both faster and broader. A lack of user friendliness seems to be a hindering factor in the development of e-government instruments.

4.2.6 Hindering factors

One of the main hindering factors for e-government is also one of its main success factors: federalism. Put briefly, complex institutional structures and many stakeholders slow down decision-making processes. In the following, the elements of federalist state structure that have a hindering impact are explained more in detail.

The subnational experimental context leads to the development of competing systems, potentially slowing down innovation on the national level. One of the main advantages of

a federal system, i.e. the flexibility to develop and test new systems in parallel therefore may become a disadvantage.

Multiplication of stakeholders: the more stakeholders are involved in the decision making process on the implementation of an element of the national e-government strategy, the longer it takes to find a consensus and a technical solution that meets all the requirements and that does not trigger strong opposition by a particular group of stakeholders.

Multiplication of solutions: In the Estonian case, at the basis of all e-government services is a national e-government system and an electronic ID for all citizens and (e-)residents. This single, unified structure is perhaps the most accelerating factor in the development of e-government technology. In Switzerland, the development of an electronic identity is still not achieved. Many of the currently functioning e-government systems rely on particular registers and identification methods (tax register, voters' register, health insurance identification number, etc.) that are not (yet) harmonised.

Moreover, political opposition of some sort is also a hindering factor to the implementation of e-government services. In our examples, this is seen most clearly in the case of e-health (data protection, different stakeholders have different stakes to the system and these might not be compatible), but also Internet voting is not free from potential conflicts over issues such as private vs. public solutions.

5. Conclusions

Coming back to our initial research questions, we conclude that there is plenty of potential for the development of innovative solutions in Switzerland, even in an environment with many difficulties.

Among the structures that enable the successful introduction of e-government instruments, several stand out: a clear legal framework that is open enough, political consensus on the matter, user friendliness, and the fostering of public-private partnerships where appropriate.

Paradoxically, both government systems – centralised government and federal systems – entail hindering factors as well as a background for the successful development of e-government. Federal systems offer a certain flexibility to test and develop competing technical solutions on a small scale, whereas centralised systems facilitate the diffusion of standardised instruments in the entire country.

The country case studies and the analyses have pointed at several difficulties and hindering factors regarding the introduction of successful e-government. Among the most important, there is the federal nature of the Swiss state. While it can also be an advantage (see above), the federal system has its downsides: finding political consensus takes longer, involves more stakeholders and government levels, and hence, the development and introduction of standardised technological solutions is more difficult, happens at a slower pace, and frequently, the outcome is the co-existence of different and competing systems.

As the success and hindering factors have shown, the Swiss system has the main advantage of offering a „testing environment“ for different e-government technologies, but the downside is slower speed. The experiences in different e-government fields lead to the conclusion that it is difficult to change the implementation and legislation procedure in Switzerland unless there is a clear political consensus to take advantage of the opportunities offered by the digitalisation of society.

The implementation of new e-government instruments (e.g. in the fields of e-health or e-identity, or even the introduction of Bitcoin payments for government services, as currently piloted in the city of Zug) is arguably best tried out at a local or cantonal level, but with a national strategy in mind.

The nationwide e-government infrastructure in Estonia does not only enable efficient administrative procedures for its citizens and unique possibilities of political participation, it also provides an environment for business innovation (e.g. with e-residency) and more innovative political communication and participation tools. One of the underlying questions of this report was to explore how some of these advantages could in some way be transferred to the Swiss context. Switzerland’s political stability combined with a strong rule of law offers a suitable background for all kinds of services that require reliable and secure technology, e.g. by using innovative systems such as blockchain technology. This structural background might be provided by other states as well. However, the unique „experimental playground“ that is provided by the small, relatively autonomous cantons

with easily accessible bureaucratic procedures is a good environment to test and develop new e-government solutions. This is shown by the early efforts to introduce e.g. e-voting and the rather early introduction of e-tax systems. In the mid-term, however, the Swiss system is rather slow and the establishment of new e-government technologies frequently fails: experimental solutions have to be compared, national strategies developed, many different stakeholders have to agree, and cantonal systems have to be harmonised. The current e-government situation of Switzerland is very much stuck in this „intermediary phase“ of implementation and harmonisation. In particular with regard to user-friendly electronic identification, but also with regard to Internet voting, Switzerland is rather deeply struggling. The country is now at a point where it either proceeds towards robust (but possibly costly) solutions that are promising in the long term, or where it stagnates in its e-government advancement leading to an almost (for such a technologically advanced and financially healthy country) embarrassing situation in comparative perspective.

Appendix

1. Table of e-government software solutions used for the tax declaration of natural persons

(egovernment.ch, 2016 with information from the e-government atlas, www.egovernment-landkarte.ch).

| Solutions | Cantons of implementation | Providers |
|---------------------------|--|--------------------------------------|
| Abx-tax.gov | GR, SH, VS, SG | Abraxas Informatik AG |
| AFORMSOLUTION (AFS) | SZ, SO, ZG, SG, several municipalities | aforms2web solutions & services GmbH |
| aXc-Cloud | - | aXcelerate-Solutions AG |
| BalTax, eTax, eTaxes | BS, LU, SZ, SG, ZG, TI, ZG | Information Factory |
| BE-Login | BE | Bedag Informatik AG |
| Dr. Tax eFiling Server | - | Ringler Informatik AG |
| Dr. Tax eGov Services | - | Ringler Informatik AG |
| eGovWeb Portal | - | Ruf Informatik AG |
| GeTax Internet | GE | DV Bern AG |
| GeTax PP | GE | DV Bern AG |
| GlaroTax | GL | Ringler Informatik AG |
| JuraTax | JU | DV Bern AG |
| Kanton AI (AI-Tax) | AI | Ringler Informatik AG |
| Kanton FR (FRITax) | FR | Ringler Informatik AG |
| Kanton NE (CLIC & TAX) | NE | Ringler Informatik AG |
| Kanton NW (Nidwalden Tax) | NW | Ringler Informatik AG |

| | | |
|---|----|--|
| Kanton OW (Obwalden Tax NP) | OW | Ringler Informatik AG |
| Larix | - | Epsilon Software Assistance SA |
| Online Steuererklärung ZHprivateTax für natürliche Personen | ZH | emineo AG |
| Osidoc E-Gov | - | OSTENDI (SWITZERLAND) SA |
| SolothurnTax NP | SO | Ringler Informatik AG |
| Steuerkalkulatoren, Steuerberechnungen | - | Information Factory |
| SuisseID Signing Service | JU | Die Schweizerische Post / La Poste Suisse |
| TaxMe-Offline für natürliche Personen | - | DV Bern AG |
| TaxMe-Online für natürliche Personen | BE | DV Bern AG |
| VaudTax | VD | DV Bern AG |
| ZHprivateTax, ZHprivateTax- Light, Private Tax | ZH | Information Factory |

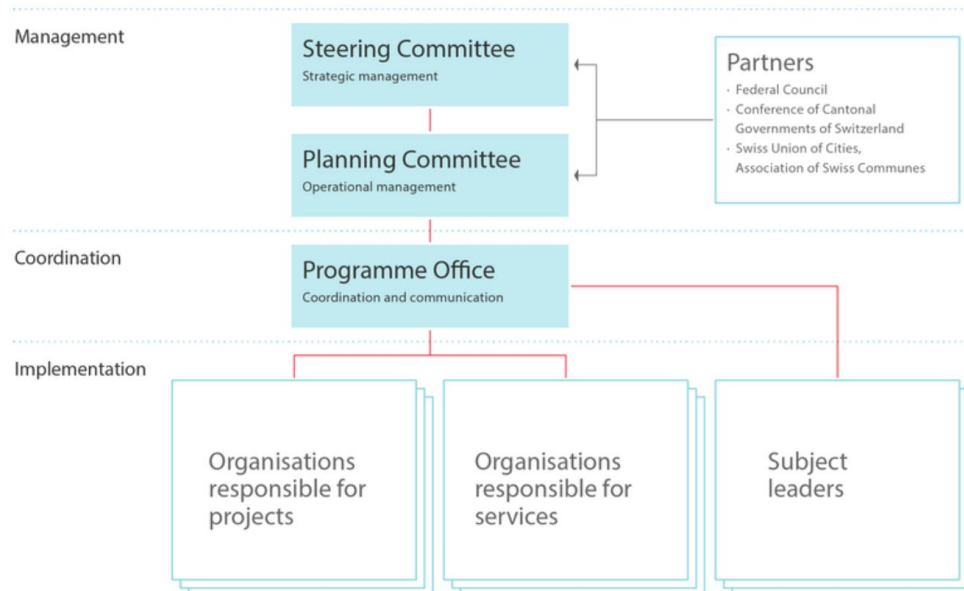
2. Members of the Swiss E-Government Planning Committee¹⁶⁵

- **Peppino Giarritta**, Head of eGovernment Administrative Unit, canton of Zurich (chairman)
- **Stéphane Schwab**, Head of eGovernment Secretariat, canton of Fribourg (vice-chairman)
- **Daniel Gruber**, Vice Director, Federal Office of Justice
- **Bertrand Loison**, Head of Division Registers, Federal Statistical Office
- **Dieter Tschan**, Federal eGovernment Coordinator, Federal IT Steering Unit
- **Silvano Petrini**, Head of IT Services, canton of Ticino
- **Roland Brechbühl**, eGovernment Programme Manager, Bern city
- **Gustave Muheim**, Communal President, Belmont-sur-Lausanne
- **Ivo Toman**, eGovernment Managing Director, St. Gallen (canton and communes)

¹⁶⁵ <https://www.egovernment.ch/de/organisation/planungsausschuss/>.

3. Structure of e-government Suisse

(<https://www.egovernment.ch/en/organisation/e-government-schweiz-kurz-erklart/>)



4. Swiss e-government operational objectives 2017 – 2019¹⁶⁶

1. The uniform registration procedure for e-government services on portals at various federal levels will be possible by 2019.
2. The ten most frequently requested electronic government services for the general public and businesses will be integrated in the national e-government portals by the end of 2019.
3. The most important e-government standards will be identified on an ongoing basis and developed or updated.
4. A joint organisation will be established by 2018 for the procurement, operation and maintenance of joint e-government solutions.
5. An electronic identity (eID) that is valid nationally and internationally will be established by 2019.
6. The areas of application for the electronic signature will be identified by 2017.
7. The allocation of data to a specific person in the electronic exchange between information systems will be ensured by 2019.
8. By 2019, it will be possible to seamlessly report changes of address (arrival and departure) electronically throughout Switzerland.
9. The Confederation and the cantons will continually push ahead with extending electronic voting to more voters with the aim of seeing two thirds of the cantons use electronic voting by 2019.
10. Seamless electronic reporting of VAT will be possible by 2019.
11. A systematic transfer of legal knowledge between the public bodies will be established by the end of 2019.

¹⁶⁶ <https://www.egovernment.ch/en/umsetzung/schwerpunktplan1/>.

5. List of A2C services in Switzerland as measured by egovernment-landkarte.ch

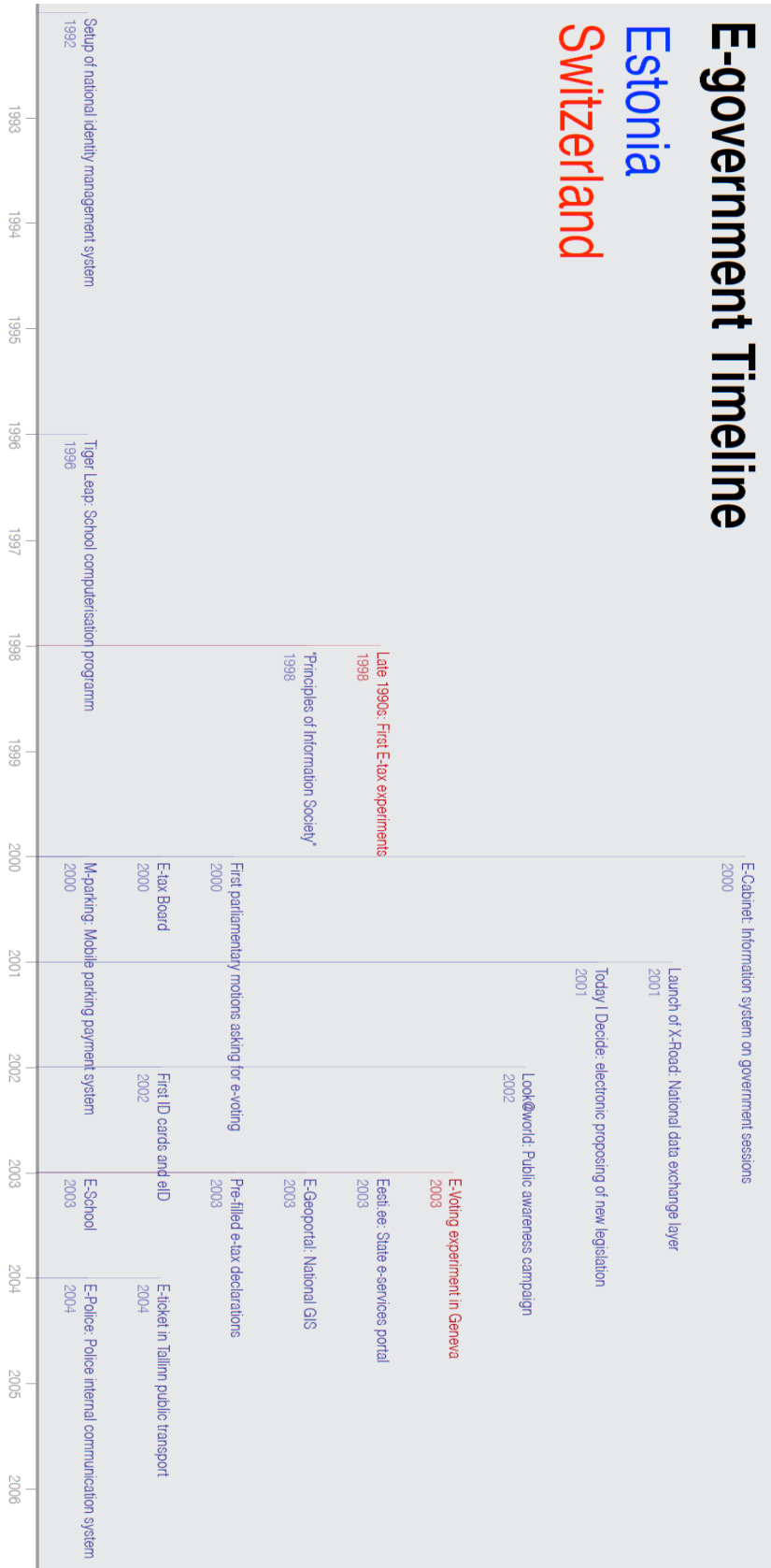
(<http://www.egovernment-landkarte.ch/#/search?nature=service&page=1&size=100>)

| Service | Beschreibung |
|---|---|
| Sign out from a municipal residency register | 1173 - Abmelden bei der alten Wohngemeinde - erfassen |
| Register change of address within a municipality | 1168 - Adressänderung innerhalb einer Gemeinde - erfassen |
| Publish consultancy on mobility (traffic rules) | 1855 - Informationen bzgl. Mobilitätsregeln - veröffentlichen |
| Issue excerpts from cataster data | 109 - Auszug aus den Daten der amtlichen Vermessung - ausstellen |
| Issue population register documents | 1144 - An-/Abmeldebescheinigung - ausstellen |
| Record inscription to municipal residency register | 1172 - Anmelden bei der neuen Wohngemeinde - erfassen |
| Signing in for vehicle inspection | 1850 - Anmeldung/Verschiebung Fahrzeugprüfung - erfassen |
| Work permit | 2 - Arbeitsbewilligung - erteilen |
| Unemployment insurance services | 17 - Anmeldung bei der Arbeitslosenversicherung - erfassen |
| Construction permits | 67 - Baubewilligung - erteilen |
| Issue of permits to practise a profession | 2477 - Berufsbewilligung - erteilen |
| Certificate of school entry | 2696 - Bescheinigung Schulbeginn - ausstellen |
| Cancel or extend executions | 192 - Begehren um Fortsetzung der Betreibung - entgegennehmen |
| Demands for execution | 191 - Betreibungsbegehren - entgegennehmen |
| Request a personal excerpt of the register of executions | 198 - Betreibungsregisterauszug - ausstellen |
| Request an operating approval | 2479 - Betriebsbewilligung - erteilen |
| Record signalings of broken street lanterns | 968 - Defekte Strassenlaterne - erfassen |
| Sign change of tenants to the municipality | 2668 - Drittmeldung - erfassen |
| Issue a copy of the marriage certificate | 1181 - Eheschein - ausstellen |
| E-payment | 2594 - E-Payment - anbieten |
| Receive e-invoices | 2592 - Empfang von E-Rechnungen - anbieten |
| Send out e-invoices | 2593 - Versand von E-Rechnungen - anbieten |
| Request a new driving licence | 929 - Ersatz des Führerausweises bei Verlust, Diebstahl oder Änderung des Namens oder der Staatsangehörigkeit - vornehmen |
| Request replacement number plates in case of loss or theft | 934 - Ersatz der Kontrollschilder bei Verlust oder Diebstahl - vornehmen |
| Issue a family certificate | 1180 - Familienausweis - ausstellen |
| Issue a copy of the family certificate | 1183 - Familienschein - ausstellen |
| Request family allowances | 228 - Familienzulagen - gewähren |
| Request time extensions for submitting tax declarations (legal persons) | 2015 - Fristverlängerung zur Einreichung der Steuererklärung für juristische Personen - gewähren |
| Request time extensions for submitting tax declarations (individuals) | 730 - Fristverlängerung zur Einreichung der Steuererklärung für Privatpersonen - gewähren |
| Issue birth certificates | 233 - Geburtsurkunde - ausstellen |
| Take out mandatory building insurance | 985 - Obligatorische Gebäudeversicherung - abschliessen |

| | |
|--|---|
| Issue construction permits for minor constructions | 2033 - Baubewilligung für geringfügige Bauten - erteilen |
| Issue extracts from the land register | 115 - Grundbuchauszug - ausstellen |
| Record new entries in the land register | 111 - Eintragung in das Grundbuch - erfassen |
| Issue permits for foreigners not living in Switzerland to buy land | 2009 - Bewilligung für den Erwerb von Grundstücken durch Personen im Ausland - erteilen |
| Issue excerpts from the commercial register | 2109 - Handelsregisterauszug - ausstellen |
| Issue ability to act certificates | 1148 - Handlungsfähigkeitszeugnis |
| Issue certificates of citizenships | 1151 - Heimatschein - ausstellen |
| Register pets | 2388 - Nationale Datenbank für gekennzeichnete Heimtiere - anbieten |
| Register dogs | 733 - Hundehaltung - erfassen |
| Request chaff cutter machines (forestry) | 800 - Häckseldienst - vornehmen |
| Publish information on property tax | 2184 - Informationen über Liegenschaftssteuer - veröffentlichen |
| Publish information on inheritance law | 1477 - Informationen über Erbrecht - veröffentlichen |
| Annual declaration of liquor production for farmers | 2705 - Jahreserklärung der Landwirte (Destillate aus Eigenproduktion) - einreichen |
| Register entries to Kindergarten (pre-school) | 176 - Anmeldung zum Kindergarten - erfassen |
| Register entries to child-care facilities (crèches) | 255 - Anmeldung in einer Kindertagesstätte - erfassen |
| Issue number plates | 932 - Kontrollschilder - ausstellen |
| Grant health care insurance subsidies | 231 - Krankenkassenprämienverbilligung - gewähren |
| Issue school curricula | 1357 - Lehrpläne - ausstellen |
| Issue learner's driving licence | 924 - Lernfahrausweis - ausstellen |
| Publish register of recent deaths | 1951 - Informationen bzgl. Todesfälle - veröffentlichen |
| Register mandatory VAT payers | 718 - Anmeldung als Mehrwertsteuerpflichtige Person - erfassen |

6. Comparative E-government Timeline

Red: Switzerland, Blue: Estonia





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