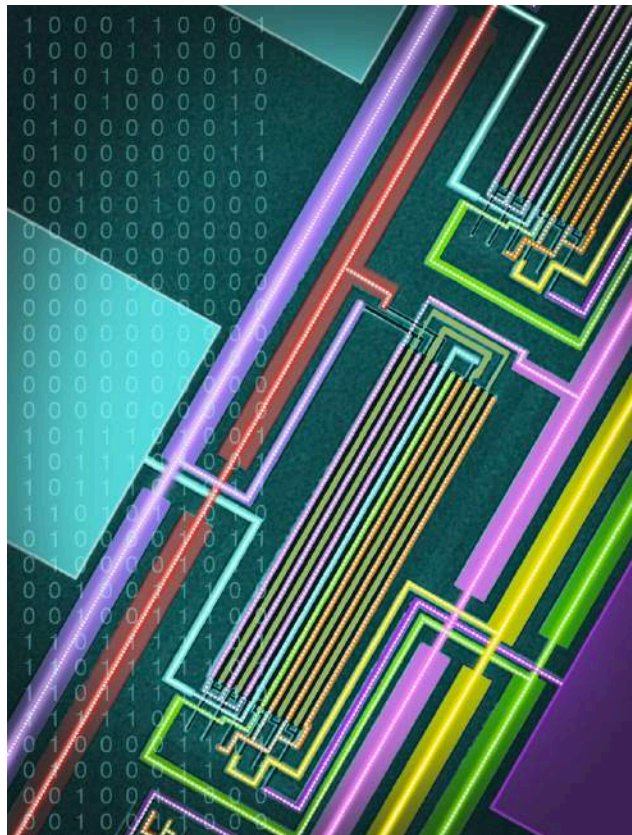




Case Study:

# **The Estonian eHealth and eGovernance System**



By Sofia Widén and William A. Haseltine  
ACCESS Health International

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**Healthcare Technology**  
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## Table of Contents

Background .....	2
National eHealth Projects.....	4
Interview with Dr. Ain Aaviksoo, Ministry of Social Affairs .....	5
About Dr. Ain Aaviksoo .....	5
Interview .....	5
Interview with Artur Novek, Estonian eHealth Foundation .....	19
About Artur Novek .....	19
Interview .....	19
Interview with Taavi Kotka, Ministry of Economic Affairs and Communications .....	38
About Taavi Kotka .....	38
Interview .....	38
Appendix 1: National Health Insurance Fund, Estonia. ....	48

## Background

The Republic of Estonia is renowned for its integrated digital government services. Citizens of Estonia use these services to apply for child allowances and driver's licenses and to vote in elections, among other things. Sofia Widén, the program manager for ACCESS Health Sweden, spent three days in Estonia to learn more about Estonian digital government services. Ms. Widén visited the Estonian eHealth Foundation, the Ministry of Social Affairs, and the Ministry of Economic Affairs and Communications. During this visit, she studied eHealth services in depth and the general eGovernance structure at large. eHealth refers to digital services used in healthcare. eGovernance refers to a way of governing a country centered on digital services. Estonian digital services have reduced wait times for citizens to access public services across governmental departments. The system has streamlined permit applications and medical examinations, and it has reduced the administrative burden for companies and individuals across the country. The Estonian eGovernance system increases the tax revenue base for the country, improves the business climate, and enhances the quality of healthcare services. The effort to provide integrated digital services is part of a greater effort to streamline public administration and to attract companies and people to settle in Estonia. Other countries can study the Estonian model and learn from Estonian policymakers.

Estonia has developed digital services in healthcare, education, banking, elections, and entrepreneurship. eHealth includes software applications in healthcare. In Estonia, the government provides the majority of these services. eHealth services include digital prescriptions and digital patient records. A number of governmental departments and public foundations are instrumental to the functioning of the Estonian system. The Estonian eHealth Foundation promotes and develops national digital solutions for the healthcare system. The aim of the foundation is to promote the development of a patient centered healthcare system with the use of technology. The foundation aspires to help patients make informed decisions around their health and treatment. The Estonian eHealth Foundation was established in 2005. Representatives from the major Estonian hospitals, the Ministry of Social Affairs, the Tartu University Hospital Foundation, the Estonian Hospital Association, the Union of Estonian Emergency Medical Services, and the Estonian Society of Family Doctors serve on the board of the eHealth Foundation. The foundation receives funding from the Estonian government.

In 1991, Estonia regained independence from the Soviet Union. Around that time, the internet as we know it today was born. The Estonian government sought a break from the old governance structures and technology. The first Estonian government after independence wanted to build a modern nation. Many people worked in the public sector with great enthusiasm. After independence, the Estonian government started to reconstruct the different governmental departments. This moment provided a great opportunity to integrate services across governmental departments and to invest in common technological infrastructures. The timing, prior to the solidification of distinct governmental departments, offered a window of opportunity to integrate services. The prime minister at that time, Mart Laar, who served from 1992 to 1994 and then again from 1999 to 2002, articulated a vision for Estonia. He wanted to modernize and implement new digital systems. The prime minister of Estonia has the power to initiate specific programs. The Estonian eGovernance program illustrates one such program. In the beginning, this program started as a technical administrative program. Since the early 1990s, the digital program has grown, and it now involves the political community, the private sector, residents, and a range of other actors.

Early on, the investments in new technological infrastructure came from the Prime Minister's Office, in close collaboration with the emerging governmental departments. Today, almost fifteen years later, Estonia is marked by strong departmental governance. Prime Minister Laar believed that a high technology country would come to benefit the whole society by creating new business opportunities for the private sector and making government services more efficient. The early 1990s marked a critical point in modern Estonian technological developments.

The eGovernance program benefits the healthcare sector in a number of ways. Healthcare is a data intense sector. The healthcare sector requires robust data systems and secure storage facilities. The experience of integrating national statistics, providing secure logins, and matching every citizen to a personal identification code helped Estonia to develop electronic healthcare applications that improve healthcare services. The Estonian eHealth system centers on a central digital infrastructure. Local healthcare systems connect to the central platform, sending and receiving healthcare data. The eHealth system includes a Patient Portal, where patients can view personal historical healthcare records, see the name of their family doctor, and find medical prescriptions. The portal is connected to one person through personal identification cards. There is a Doctor

Portal for healthcare providers, which connects to the central system and allows information exchange between healthcare providers.

### *National eHealth Projects*

From 2007 to 2013, the European Union allocated 3.4 billion euros (around 3.8 billion US dollars) in structural aid to Estonia. The Estonian eHealth Foundation used European Union structural funds to develop four national eHealth projects. From 2005 to 2008, the eHealth Foundation focused on electronic health records, digital registration, digital images, and digital prescriptions.

There are three main objectives of the national eHealth projects. The first objective is to streamline the documentation process in healthcare. The second aim is to provide timely accurate information to healthcare providers. The third aim is to deliver high quality patient centered healthcare. The total cost of the national eHealth projects is around thirty five million Estonian kroons (about three million US dollars).<sup>1</sup>

The largest eHealth project is the electronic health records system. This project aims to develop a basic infrastructure for the integration of healthcare provider data. The digital images, digital registration, and digital prescription projects will use the same message administration, authorization, central data storage, and other services created in the framework of the electronic health records project.

Ms. Widén conducted secondary research into the Estonian governance model. Following this, she conducted primary research in Estonia. What follows are three interviews with Dr. Ain Aaviksoo, Artur Novek, and Taavi Kotka. The interviews shed light on the historical development of the eGovernance system, explain the fundamental digital infrastructure, and provide insights into how residents in Estonia experience their eNation.

## Interview with Dr. Ain Aaviksoo, Ministry of Social Affairs

### *About Dr. Ain Aaviksoo*



Dr. Ain Aaviksoo is the deputy secretary general of eServices and Innovation in the Ministry of Social Affairs, Republic of Estonia. Dr. Aaviksoo holds a Master's in Decision Analysis and Quantitative Methods in Public Health from the TH Chan School of Public Health at Harvard University. He also has a PhD in Medical Informatics from Tallinn University of Technology and a medical degree from the University of Tartu, Estonia. Dr. Aaviksoo worked for seven years as a practicing clinician. In 2001, he was appointed head of the Public Health department at the Ministry of Social Affairs. Dr. Aaviksoo has been a guest researcher at the World Bank, managing director at Praxis Center for Policy Studies, chairman of the Health Estonian Foundation, and chairman of the Estonian eHealth Foundation. In 2010, Dr. Aaviksoo founded his own consultancy, called HealthIN, and became a lecturer at Tallinn University of Technology. In March 2015, he was appointed deputy secretary general for eService and Innovation at the Ministry of Social Affairs. At the same time, he was working as the chairman of the National eHealth Task Force at the Government of Estonia. In these two roles, Dr. Aaviksoo is a key player in the strategic development of eHealth in Estonia.

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### *Interview*

**Sofia Widén (SW):** Tell me about your work in Estonia.

**Ain Aaviksoo (AA):** I work with eHealth governance as deputy secretary general for eServices and Innovation. Healthcare policies are always a delicate issue. You need to innovate and try different things. Old school healthcare is very conservative. The patient goes to the doctor, the doctor sends the bill to the health insurance company, and the health insurance company pays for the bill.

I am responsible for the innovation of new healthcare policies. While the deputy secretary general for Health is responsible for healthcare policies, I take systemic level initiatives to a nationwide pilot stage. I help to gather evidence and attract



people from the private sector and academia to work in different forms for healthcare.

The Estonian digital governance structure has helped us to develop a digital eHealth structure. We did not build a specific eHealth system. We relied on an overall governance structure and added specific requirements for healthcare, such as secure logins and identifications. We built a system based on trust and transparency. The public controls their personal data. A person can see who has access to their data.

**SW:** As a user, I see exactly what healthcare providers have access to my information.

**AA:** Yes. Users see who has access to their data. Users also see who has accessed their data. Users see the name of their doctor or the police officer who has viewed their data. That transparency gives Estonian citizens the feeling of security that their data cannot be misused. I would categorize the eHealth system of Estonia as a trustworthy entity.

Take a sensitive issue like eElections: The first time we had eElections, only a few hundred voted online. We gradually built trust in the system. Citizens saw that they could trust the system. The same has been the case with all other services.

When we introduced eHealth in 2008, we already had six years of history. We could file our taxes electronically. We had a cutting edge eBanking system. This brings up another point of our information technology infrastructure, which enables an exchange of information across the public and private sectors. Each participant adds to the trust of the system.

There has not been a major technical data bridge yet. Every new organization or service that will be offered can build on this history. It is important to understand why people in Estonia are much less concerned about privacy and other security measures.

We also have a strong data protection agency. I engage in discussions with the legal department about how we can extend services so that we sustain the trust. We want to combine national statistics from different sources. Our ethics committee will review our proposal. Even when we use aggregated depersonalized data, the ethics committee will review our proposal.



Every country that aspires to build an eNation needs sophisticated technology and investments. An eNation is a country that aspires to deliver integrated online services to its citizens. It will take time to build an eGovernance system. If you have that in place, you can expand your services rapidly. For example, we increased our ePrescription system from zero to eighty percent in nine months.

Last year, we launched eCertificates. This is an integrated service for our citizens. When you apply for a driver's license, you need a medical examination. Today, your medical history is automatically sent to the Department of Transportation. You still need a doctor's appointment, but if you are fine, the doctor just adds an electronic signature.

The individual sees that the doctor shares the medical decisions with the Department of Transportation. The system is quite complex. The basis is information exchange.

**SW:** Did the politicians conceptualize this eGovernance system?

**AA:** Yes. The initial political vision was straightforward. We had a famous prime minister, Mart Laar. He was a determined and firm man. To be a good politician, you need to have good advisors. Estonia was already technologically advanced at that time. This system that I am describing now was established at the turn of the twenty first century. Ten years prior, in 1991, Estonia regained independence. At the same time, the internet was born. The Estonian people wanted to leave everything old behind. At the same time, everything that was new was instantly considered beneficial. We skipped checkbooks for electronic banking. We skipped copper wiring. We immediately used light cable. Mobile phones were rapidly adopted. This is the background of the Estonian eGovernance system. This is my theory.



Mart Laar, the Estonian Prime Minister from 1992 to 1994 and from 1999 to 2002.

**AA:** Once the system was put in place, we started collecting a lot of data. We realized that the system would grow. We wanted to find a solution to handle all the data. We invited multinational corporations, companies like Microsoft, to design a system for us. The large companies offered to design an eGovernance system for us, but we could not afford it. The managers at the state information agency offered to build a system that would cost less. This was at the time when the Russian forces retreated from Estonia.

We had the opportunity to start anew. Many people worked in the public sector with great enthusiasm. We were adopted as an accession member to the European Union. Smart politicians in Estonia saw this as a great opportunity. I worked as a civil servant at the Ministry of Health, where I served as head of Public Health.

From the beginning, we decided to integrate information technology across different departments. We did not have different departments when we started. Everything was managed from the Office of the Prime Minister. We have strong departmental governance. Our prime minister can initiate certain programs. The eGovernance program is an example of such a program.

**SW:** Was it a bureaucratic system?

**AA:** Yes. The system was initially perceived as bureaucratic, but also political. In the beginning, politicians lacked the capacity to develop the country. They were blocked by the bureaucratic system. The public sector began a joint effort with the private sector.

A technologically advanced country will benefit the whole society, including the development of new business opportunities for the private sector. For example, the private sector paid to train citizens how to use the eBanking system. This investment opened new doors for the private sector. The change toward a new technical era for Estonia had begun. Today, we live in a transparent society. With eGovernance, no political party can take over the whole country.

**SW:** What actors in the private sector financed the eBank training?

**AA:** Banks and telecommunication companies. The majority of the banks had Swedish owners. The telecommunication companies had shareholders from Scandinavia. The Scandinavian business culture highlights corporate social responsibility. That culture influenced companies to make long term investments that would gain society.

Today, the Estonian banking system is a leader with its financial services and technical skill sets. The banking system is the main export for information technology companies in Estonia. The majority of the banks and the financial institutions in Scandinavia run on software developed in Estonia.

**SW:** How do patients respond to the Estonian eHealth systems?

**AA:** Patients assume that the doctor has all information available about them from previous visits, and even from previous visits to other institutions. Patients are not concerned about somebody sending their data. Patients are concerned if their data are unavailable. All healthcare providers are obliged to report the medical records to the national eHealth record system. This eHealth record system is accessible to all healthcare providers and to citizens.

**SW:** Is trust an important component in this record system?

**AA:** Yes. You must build trust among the providers and patients. The national eHealth record system empowers people. Patients can question their doctors, and doctors can obtain the medical histories of their patients. Tallinn Central Hospital was the first hospital to provide a full electronic medical record system for patients. People feared what would happen. Doctors were concern about increased demand for healthcare services from patients, as a result of increased transparency. Nothing like that happened. Instead, the increased transparency changed the patient doctor relationship. Patients and doctors now base their conversations on the same information. However, this is just one hospital. Doctors from other hospitals are still reluctant to provide a full electronic medical record system.

I recently visited Kaiser Permanente in the United States. At Kaiser Permanente, the doctor and the patient share the same screen with the patient's medical record. The patient can see what the doctor bases her medical decisions on and what the doctor writes in the medical report. Together, they go through the patient's health information. This is the future.

**SW:** Can patients access their medical reports online at home through Kaiser Permanente?

**AA:** Yes. It works the same way as in Estonia. Medical reports for laboratory test results and radiology test results are also available online. Patients can access the test results at the same time as the doctor. There are exceptions, however, for some psychiatric diagnoses, HIV, or other diagnoses reported by the physician.

Transparency is the key to building trust and engagement in the doctor patient relationship.

**SW:** Do all healthcare providers in Estonia use the national eHealth record system?

**AA:** No. About ninety five percent of the Estonian healthcare providers use the system. It is a two way system. First, healthcare providers need to record medical decisions in the system. Second, the same providers need to use the available information in their daily work.

The law obliges healthcare providers to follow these medical report obligations. Doctors can also be held legally accountable if they ignore available patient information. The type of healthcare providers that deviate from these obligations vary. All hospitals use the national eHealth record system. Around ninety five percent use it within primary care. For small dental practices, which would need additional investment, usage is lower, around seventy percent. The government should have a more active role in increasing the use of the national eHealth record system.

**SW:** Are there any penalties for healthcare providers who do not use the eHealth record system?

**AA:** No. We have legal penalties, but they are not enforced. Instead, the government negotiates with the opposing providers who are delaying the implementation of the eHealth system. The Estonian government is preparing a new national eHealth strategy. The government uses structural funds to invest in eHealth. This money is not enough to help all providers take the step into eHealth. We need to use our national money for this. We have the governing services in place. Now we have to invest in the providers so that doctors have the right eHealth tools.

**SW:** What areas in eHealth need improvement most urgently?

**AA:** We need to introduce a good decision support system for physicians, nurses, and patients. It is impossible to make rational decisions with all the information we have in the medical record systems. We have the technical solutions. What we need is an agreement. For instance, if you have data series of different blood pressure measurements, the data series vary. We need to standardize work processes for physicians to follow. Doctors need a support system to help them make rational decisions.

**SW:** How do physicians react to this?

**AA:** I think doctors acknowledged that we must introduce this support system. We try to avoid power games. It is the role of the government to manage this change.

**SW:** Who needs to take the lead in this change?

**AA:** It is the responsibility of the Ministry of Social Affairs, together with my colleagues and me. I am responsible for eServices innovation. The Ministry, my colleagues, and equal partners are responsible for the eHealth policy. I help with technology development, digital development, service innovation, and service design components. The main goal for the government is to keep the momentum, improve quality, and implement good quality measures. In two years, the government will measure all clinical areas and all providers.

**SW:** What will you measure? Will you measure health outcomes?

**AA:** Yes. We will measure health outcomes and patient level quality outcomes. We will base these outcomes on the information available in our national eHealth record system.

**SW:** What type of indicators can measure success?

**AA:** Success indicators are an interesting debate. I believe it must be a set of indicators and one policy goal indicator. For instance, we measure the survival of stroke patients and the incidence rates of stroke. The goal is to keep the number of stroke cases low, not to treat as many strokes as possible with the best possible outcome. However, we need to measure both indicators. If we compare survival rates with mortality rates three months after discharge, we must also include aftercare and rehabilitation in the measurement.

My vision is that we cover all areas with good indicators and have the whole healthcare team of different specialists working toward the same goals. Given our technological capabilities, this can easily be done in Estonia.

**SW:** You have the technology, but what about care coordination?

**AA:** Care coordination is the difficult part. All healthcare professions need to understand that they treat the same patient and that they need to collaborate. This is still a problem in Estonia. A neurologist at the hospital cannot control the social rehabilitation of the patient. They need to collaborate. Healthcare

specialists have agreed on this change in attitude. The Ministry already finalized the initial background report that suggests where and how to start this change. We will start with one pilot program for personalized medicine and another pilot program for deployment of outcome and value based healthcare. This is how we tie the healthcare system to health outcomes.

**SW:** What made the Estonian government able to make these strategic decisions toward technological development and eHealth?

**AA:** I think one reason is the low average age of our ministers in Estonia. Few are over the age of forty. When I was head of the Public Health department, the government was full of young people given high level positions. I think this partly explains why several bold decisions were possible at that time. However, the junior ministers ignored healthcare issues. The young ministers were healthy. They overlooked the importance of a well functioning healthcare system.

The government appointed me head of the Public Health department because of my residency training. I was inexperienced in public service administration. I developed my skills through social activity and later through my studies at the Harvard School of Public Health. This was the case for all departments. During the phase out of the old Soviet regime, Estonia was left with a group of inexperienced ministers and a new Public Health department. This situation created unique opportunities for Estonia.

**SW:** Did any other opportunities arise for you?

I worked as managing director for the nonprofit organization Praxis Center for Policy Studies.<sup>2</sup> Praxis is a public policy think tank that George Soros established across Eastern Europe in 2000. Today, Praxis is funded by research grants and government contracts. Mr. Soros funded the initial period. His idea was to work with government level policies but be politically independent. We were only allowed to take on contracts that would maintain our independence. It was a unique setup. We were critical of the government that funded us. I think this reflects Estonian culture.

Estonia built its democratic society quickly after the Soviet regime. This created a culture that is open to criticism of the government yet is in a constructive dialogue. Organizations with a good reputation and solid arguments receive funding from public sources. These organizations are politically independent.

**SW:** Have you worked with eHealth in any other countries beside Estonia?

**AA:** I consulted in Ukraine and Moldova. I had my own consultancy and received funding from the World Bank. Ukraine was an interesting case. I helped the Ukraine government develop a healthcare strategy. I also worked for the World Bank in Costa Rica, consulted on some projects in Mongolia, and delivered training to several delegations around the world.

**SW:** Did you consult on national strategies?

**AA:** Yes. My field of expertise is healthcare systems and transformation. I know how to use technology to transform healthcare systems. Hospitals were my other specific interest. I spent almost three years at North Tallinn Medical Center, the largest hospital in Estonia.

I was contracted by the hospital management team to implement a quality management system. I started to work on an information technology project, interviewed all thirty three clinical units, and helped them formulate a strategy for quality implementation. I then linked that strategy to their information systems. With this link, they could implement the strategy immediately.

Some systems needed further development. I also guided the technology team on how to implement my first solution. My first solution was the dashboard for monitoring complications, mortality, and cancer treatment indicators.

**SW:** Did you help to improve quality processes at large hospitals?

**AA:** Yes. I told the hospital management team that they needed five years of work based on this strategy. After that, I left the project and was invited to my current position. It was half a year of intensive recruitment.

**SW:** Who recruited you to your current position?

**AA:** The secretary general of the Ministry of Social Affairs recruited me. She is known for her persistence and for recruiting people from the private sector to the public sector. She used to be secretary general of the Ministry of Economic Affairs. I knew that she recruited Mr. Taavi Kotka to be the deputy secretary general for information and communications technology at the Ministry of Economic Affairs and Communications. Mr. Kotka is working at the Ministry of Finance and Communications. The same person that brought Mr. Kotka to the public sector also recruited me. It was a very tough decision for me to join the public sector. In six years, my consultancy had grown substantially. However, it was still too small to transform all healthcare systems.



**SW:** Did you have more influence working for the government?

**AA:** Yes. As I said before, Estonia was in a unique situation. I had an opportunity to influence the eHealth development in Estonia for the next three to five years. Estonia was the only place on the planet where the government could immediately start to work at a large scale.

My mind always works at the systemic level. I knew I could make a difference with my skills. Given that Taavi Kotka was in the Ministry of Economic Affairs and Communications, I saw great opportunities in economic affairs and communication. We had large structural funds to be allocated. Regardless of change in the government, I knew that every political party supported this area. Even the information technology advisor at the Office of the Prime Minister was on my side.

**SW:** How do you evaluate success? What do you look at in these different eHealth systems?

**AA:** In other industries, information technology has transformed radically. For our society to gain full benefit in healthcare, information technology must change. Systemic change will improve healthcare. Minor improvements are a start. One improvement is if we prevent diseases instead of measuring how well we treat them. Another improvement is if we stop viewing patients as objects and rather see them as masters of their own health. We need high patient engagement. These changes are true successes.

**SW:** Which countries do you look up to?

**AA:** I think Denmark reached the farthest. However, it is difficult to copy. The Danish healthcare system is different. Nobody understands how it is financed. Denmark used information technology in their healthcare transformation. Scotland is also an interesting case. As far as I understand, Scotland had no grand plan on how to improve their healthcare system. Instead, the Scottish Telemedicine Center employed bright people to manage the transformation. The employees created value and others embraced it. As a result, Scotland became a strong player in healthcare systems.

The Nordic countries have a great advantage compared to the rest of the world. The integration of healthcare systems works better in the Nordic countries. Healthcare integration solutions are very popular around the world. I want to

show the rest of the world that technology combined with healthcare integration solutions can create value.

**SW:** Can you compare these healthcare systems with the United States?

No. It is wrong to compare the large healthcare costs in the United States with healthcare costs in Europe. The healthcare systems are different. In the United States, they spend more money on healthcare. However, what Europeans consider social care is often included in the American healthcare package. The European systems are also more tax financed.

The United States is a huge country with more than just one healthcare system. As I mentioned before, Kaiser Permanente is a good example. They developed the patient engagement that I am looking for. Kaiser Permanente showed how information technology could reduce the workload of healthcare professionals and at the same time improve the health of individuals.

**SW:** Would you say that healthcare in the United States is accessible?

**AA:** Yes. American healthcare is accessible. Still, they have fewer doctors than we have in Estonia or in Scandinavia. I think that is unique. Singapore is also a country where I would look for pragmatic solutions. The Singaporean government can afford to be pragmatic. They can implement a rational healthcare system. However, you must have the ability to correct wrong actions immediately, if need be.

**SW:** Estonia has a committed government. You used World Bank funds and structural funds for your healthcare investments. What is the proportion of national funding versus international funding for your projects?

**AA:** It depends. In 2015, more than half of the funding is national. However, healthcare providers create value. Healthcare providers are responsible for the systems, not the government. These systems are paid by the reimbursement that the providers gain from health insurance and tax funding. Overall, national healthcare costs are covered by taxes. However, the government used World Bank funds or structural funds to invest in specific healthcare services or areas that enabled further healthcare improvements. I think that was a smart move by the government.

**SW:** What areas did the government invest in with additional money?

**AA:** The national eHealth record system and the standardization of treatments with eCertificates are two examples. Estonia has decentralized healthcare service provision. The independent hospital managements decide what tools to use, what land they buy or sell to, and what people they want. The government gives some incentives through health insurance funds contract policy.

The government also created eCertificates to create a nationwide healthcare service for certain prescription drugs. Each individual service provider is uninterested in developing that kind of eCertificate service. This healthcare service will also create a spillover effect to other services and generate additional standards, agreements, and work processes in need of alignment. Information technology has the power of standardization. Even in decentralized systems, the government can gain control by using information technology.

**SW:** Sweden, Singapore, and other countries around the world are faced with rapidly aging populations. How can Estonia counter those effects with your healthcare system?

**AA:** In Eastern Europe, we are only starting to see an aging population. We lack the funds to develop an elder care system. Estonians expect the government or public sector to take action. We can use technologies to avoid institutionalizing people by building smarter healthcare systems. We should try to find services that are provided in the community.

Today, frail elderly people are simply allocated somewhere without thinking about the funding or the responsibility. Instead, we should focus on the patients, the services that this person needs, and how to integrate the relatives.

**SW:** How do you engage the informal caregivers?

**AA:** We do not know yet. I worked in the Ministry of Social Affairs with the deputy secretary general for health and our colleagues at the social service. We work together toward coordination of care with family and informal caregivers. We have political commitment and allocated funds from the state budget. However, we do not yet know what those actions will be. Some strategic development is underway. Structural funds are also allocated for integrated services in the community for elderly people.

**SW:** In Sweden, the municipality is responsible for elder care and the county for healthcare. The problem is that they use different electronic health records and are governed by different laws.

**AA:** I do not know how care coordination works in Sweden. In Norway, the government is responsible for healthcare, and the municipalities are responsible for social care. It works really well. They changed the financial model so that twenty percent of the funds that used to be allocated to the hospitals are now directed to the municipalities. The government then instructed the municipalities to pay twenty percent of patients' bills. This resulted in increased innovation in care coordination. They wanted to coordinate the local hospital family practitioner with the social homecare nurse. However, ideal solutions only exist in theory. Norway is a rich country. They had the money to invest in care coordination but never found an ideal solution to invest in.

**SW:** If there are no ideal solutions, why does care coordination still work in Norway?

**AA:** I think the key is a shared financial responsibility. If you bundle the financial responsibility, healthcare providers must solve the problems together. With shared financial responsibility, care coordination becomes much smoother and creates a demand for information technology to innovate further.

**SW:** When a nation start to build a social care and elder care system, it is impossible to control which eHealth record system the healthcare providers choose to use. However, the nation can integrate the record systems.

**AA:** Yes. At the municipality level, the eHealth record system in social care is minimal. It is very basic. We need to find a viable solution to integrate the record system in social care with the national healthcare database. We have the infrastructure to do this. An exchange of information already exists. For instance if you apply for incapacity to work or for social benefits, you go to the social security agency to receive an expert judgment. The social security agency uses the national eHealth record database to assess your needs. If necessary, they ask for additional information. However, about sixty percent of agency work and decisions are done using the existing information in the database.

**SW:** Who grants the authority to check the health data of an applicant?

**AA:** The applicant grants the authority for the agency to check your health data. We want to make the system even more transparent to keep our trust. The amount of cross database traffic is increasing. To keep the trust the system has to be transparent.

I want to collect all preauthorizations in one single place. Today, I must check the authorizations at each individual agency that initiated the process. We just debated this issue this morning. I want the preauthorization service to be available on mobile devices for all citizens. If you are participating in a research project, you can access information from your mobile phone about where your data is being used. Compare it with how you manage the security rules for your Facebook account. This is impossible. Users are unaware of the end result. I want to avoid this situation in healthcare. I want to develop a preauthorization service that is accessible and easy to use. First, you see what you authorized. Then you check whether everything is as you authorized it. If needed, you approach the organization to ask for verification.

**SW:** Thank you, Dr. Aaviksoo, for sharing your views on eHealth and eGovernance.

**AA:** Thank you, Sofia.

## Interview with Artur Novek, Estonian eHealth Foundation

### *About Artur Novek*



Artur Novek is an implementation manager and architect at the Estonian eHealth Foundation. He has a Bachelor of Applied Science degree in Mathematical Statistics from the University of Tartu, Estonia. From 1998 to 2008, Mr. Novek worked as a programmer and development manager at AS Medisoft. He has been in his role at the Estonian eHealth Foundation since 2008. Mr. Novek has lifelong experience in programming and Structured Query Language, especially in Microsoft servers.

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### *Interview*

**Sofia Widen (SW):** Can you tell me a little bit about yourself and your background?

**Artur Novek (AN):** I was born in northeastern part of Estonia, an industrial city called Kohtla-Järve. Many Russians live in this part of Estonia. This mix provided an international perspective for me. I attended music school and took ballroom dancing lessons. I played in an orchestra. I attended the University of Tartu to receive a background in computing, a new area at the time.

**SW:** In what years?

**AN:** Around 1990. We regained our independence in 1991. I am now working here in Tallinn at the Estonian eHealth Foundation. My title is implementation manager and architect for the Estonian eHealth Foundation.

**SW:** Please describe your work.

**AN:** We are thinking of improving our eGovernance system by creating a distributed system. We now have a central system. A central system describes the communications infrastructure. When I talk about a central system, I refer to the architecture of the eGovernance system. I will not go into the details of the complex foundations. I have a presentation that describes the architecture in

detail (see Appendix II). My presentation is also available on the Estonian eHealth website.<sup>3</sup>

I have a new vision for an information system for the future. The current central system is based on a collection of documents and data at one central portal. I believe we should create a system that allows direct access to our central system from the local systems. The local systems include individual healthcare providers. The new system should not be based on centrally collected documents. Instead, the new system should link directly to local systems, exchanging information with local healthcare providers to an even larger extent than we do today.

**SW:** How many people work at the eHealth Foundation?

**AN:** We have around fifty permanent staff members. Recently, there has been a lot of staff turnover. The eAmbulance team of thirty used to be part of our operations here. They are no longer here.

**SW:** Was the eHealth Foundation created in 2005?

**AN:** Yes. We started thinking about an exchange of health information toward the turn of the century. The Central Health Insurance Fund made this system possible. Through the fund, we have central funding for eHealth. Most of the money comes from the government side and from the National Health Insurance Fund.<sup>4</sup>

**SW:** Is that a state insurance system?

**AN:** Yes. It is state health insurance program. People pay into the fund with tax money.

**SW:** Is everyone in Estonia a subscriber to the National Health Insurance Fund?

**AN:** Most people are. If you lose your job you lose the insurance. Prescriptions are included in the health insurance. Every person who paid taxes obtains health insurance.

**SW:** How do you provide health insurance to people who have no job, no income, or are unable to work?

**AN:** Estonia provides a compulsory health insurance for all Estonian people, including uninsured people who are unable to work. This public health insurance is funded by social tax. The employer pays for the health insurance of the



employee. The health insurance corresponds to thirteen percent of the gross salary.

Apart from this social tax, the Estonian Health Insurance Fund covers medical care for the insured people. The Estonian Health Insurance Fund also covers the emergency medical care for all Estonian people. The care provider receives money from the Estonian Health Insurance Fund for emergency medical care of people who lack health insurance. The majority of municipalities also cover costs for family doctor visits of uninsured people.

**SW:** Was the eHealth Foundation created by the National Health Insurance Fund?

**AN:** No. It was a strategic idea not to mix the two institutions. This is an important point. We believed that financial support of the eHealth Foundation by the National Health Insurance Fund would allow them too much influence. The eHealth Foundation was established by three of our biggest hospitals, the Social Ministry, and three medical unions. The hospitals are North Estonia Regional Hospital, Tartu University, and the East Tallinn Central Hospital. All of these institutions serve on our board.

**SW:** Please describe the history and the mission of the eHealth Foundation.

**AN:** We started to apply for support in 2013. The Social Ministry wished to create a health information exchange. Developers proposed four different architectures for such a system, including distributed and central systems. They started to find the organizational structure of how to manage and implement the system. We talked about every possible kind of setup. We thought it would be difficult to obtain national statistics from a distributed system. We also thought it would be more difficult to build, manage, and finance a distributed system. We chose a central system.

**SW:** What do you mean when you say central and distributed systems?

**AN:** In a distributed system, information is collected locally. To make such systems work, all the local systems need to communicate. Some distributed systems have a small central core. In a central system, most information is collected and stored in one place.

**SW:** Is all information collected and stored in one place with a central system?

**AN:** Some information is collected and stored in one place with one central system, such as the National Health Information System. Two exceptions are

billing information and medical images. The Estonian Health Insurance Fund collects billing information and the National Picture Archive collects medical images.

Some information also remains in the information systems of care providers. This type of information is not covered by the published standards of the Estonian eHealth Foundation. Doctor can also select the data for case summary document. This information will stay in the information system of that care provider. Information also remains in devices and information systems that are disconnected to their main information system. Some information is also still on paper and in the head of the doctor.

**SW** Can national statistics be extracted from a central system?

**AN:** Yes. The main function of the system is to distribute information among healthcare professionals.

**SW:** Which is more expensive, a central or a distributed information system?

**AN:** Distributed systems are harder to develop and maintain. The systems not only need to communicate with one central system, they also need to communicate with each other. It is more expensive to build and maintain a distributed system, and more difficult to extract national statistics.

**SW:** So you created a central system?

**AN:** Yes.

**SW:** I think that we have a distributed system in Sweden. You can send information to a central system, but the subsystems are incompatible.

**AN:** I know that Sweden has a good version. The system works well. The regional systems communicate with each other. Your regions are the size of Estonia. India is a very big country. The country is too big for one kind of central system. Our systems is suitable for five million people. That is the limit. If more than five million use the system, it becomes difficult to manage.

**SW:** Tell me about eGovernance.

**AN:** The eGovernance system is a system of electronic services provided by the government. Citizens can obtain many services online. We were early with eBanking Estonia. This was one of our first eServices. In the mid 1990s, we began to prepare eBanking services, beginning with automatic teller machines and bank cards. In the beginning of the 2000s, we introduced electronic personal identification cards. The state provides everyone with an identification card and mandates its use.

**SW:** Please describe the personal identification card.



Picture showing an Estonian personal identification card connected to a computer.

**AN:** This is an identification card (holding up the card) that I can use to identify myself. Wherever I need identification, I can show this card. It has a chip that I can use for electronic services and to identify myself safely. The card employs two factor authentication. I need to know my pin code. If I lose my card, nothing happens because the person has to know the pin to use it. I can close down this card. I can call the police to do so.

**SW:** With this personal code you can obtain services from the government.

**AN:** Yes. You apply for this card at the police department.

**SW:** You use this in healthcare as well?

**AN:** We are using this card everywhere where we need a digital identifier for public services. If I want to go to the Patient Portal, I can use my card. There is also mobile identification, but to obtain mobile identification you first need this card. At the end of last year, five percent of Estonians used the Patient Portal. Still, I think electronic usage is quite high. About one third of Estonians use the card for electronic voting.

**SW:** When was the personal card introduced?

**AN:** We introduced the card for government and eBanking purposes in 2001 to 2002. A certification center was established.

**SW:** What percentage fraction of the population uses these cards?

**AN:** Almost everyone. We have 1.3 million citizens and 1.2 million card users. About twenty percent of the population uses the card on any given day.

**SW:** Please provide some historical background.

**AN:** When the electronic thing started to appear, it was because of the funding. The insurance fund started to pay the bills. The insurance fund used the system to send bills to their customers.

The system began when local units of the insurance fund began electronic billing. Some local units collected doctors' opinions of their cases as well. We then began to think about how to collect and exchange health information more broadly.

**SW:** Did the National Insurance Fund send bills to the hospitals?

**AN:** Yes. The information was sent to the hospitals. The managers of the system collected information regarding procedures, operations, diagnoses, and hospital stays.

**SW:** Did this include patient data as well?

**AN:** Yes. Healthcare data was included. Then we applied for and received funding from the European Union, in the summer of 2003, to build a central system. We used structural funds. From 2006 to 2008, we focused on four projects: electronic health records, digital images, prescriptions, and

registrations. We went live with parts of the electronic health records in December 2008. By then, I was already with the Estonian eHealth Foundation.

I worked with digital registration. Previously, I worked at Medisoft, a software company. Medisoft made information systems for hospitals and for primary care general practitioners. I was already familiar with the technologies.

**SW:** So the eHealth Foundation ran four programs: the electronic health records, digital images, digital prescription, and digital registrations. Please describe these programs?

**AN:** The purpose of the electronic health record is to obtain medical documents. We store detailed information on each procedure. We store laboratory data as well. The electronic records detail diagnoses. Doctors can digitally sign the patient records. All of this information is centralized. The information cannot be changed once the doctors have signed off. This signature provides a high level of security.

**SW:** How long did it take to introduce digital patient records?

**AN:** About five years.

**SW:** Was all of this developed entirely in Estonia?

**AN:** Yes. We used an international standard Health Level Seven International (HL7) for the commands and for the information exchange messages. Health Level Seven provides a framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information.

**SW:** In 2008, when you rolled the system out, how many healthcare providers and hospitals joined the system?

**AN:** We began with one hospital, the Estonia Central Hospital. The Central Hospital had already made their system compatible with ours. The North Estonia Regional Hospital followed in early 2009. The others followed suit. I think we covered ninety five percent of inpatient care by 2012.

We began to gather national health statistics in 2012. It went live in 2013. The Health Development Institute conducted a large study of our work. They found that we cover over ninety five percent of inpatient care and around forty percent of outpatient care. We collect information about patients once their treatment is

finished. For some outpatients, it is difficult to determine when treatment is finished. This is a problem for patients who suffer from chronic diseases.

**SW:** How do you handle the data for patients with chronic disease?

**AN:** We open the case when the patient comes in. We close the case after six months if the patient does not return or has a chronic disease.

The basic idea of electronic health records is information exchange. Doctors send comments and extract information.

**SW:** You send all this data in about patients visits, the length of stay, and laboratory test results. What kind of information do you receive as a healthcare provider?

**AN:** You see everything that you record. You also obtain time critical data such as important diagnoses, allergies, recent prescriptions, main operations, and injuries. You receive this information immediately when you see the patient. In April this year we launched an emergency system on iPads for critical data.

**SW:** Anywhere in the country?

**AN:** The electronic health records work everywhere in the country. We are rolling out the emergency time critical data step by step. We started in Tartu. This month we introduced the emergency system in Tallinn.

The second project of the eHealth Foundation focuses on digital images. We have struggled with digital images. We have not yet found the best architecture. Today, the program allows exchange of X-ray and other images.

**SW:** How would you like to improve that system?

**AN:** Now, everyone uses his or her own system. Estonia is a small country with few people. We can use one system. I would like to have a single system. For large countries, this would be impossible. You would need some sort of distributed system. I recommend that large countries use smaller regional systems, each for five or ten million people. It has to be about local governments or local municipalities.

The third project of the eHealth Foundation focuses on digital prescriptions. The Health Insurance Fund led this project. In 2010, when the project started, we encountered problems with the speed and the availability of the system. Still,

digital prescriptions had a very high usage rate. In the first year, over ninety percent of Estonians used digital prescriptions.

**SW:** Where was the problem?

**AN:** The problem resided in the information technology. The founding company did not manage to establish the system properly. I believe that they underestimated the volume of data. The system could not handle the peak volumes that arose at the beginning of each month. We solved the problem by mid 2010 by bringing the system in house. Today, the system works well and is used throughout the country.

**SW:** What is the rate of digital prescriptions?

**AN:** The rate of digital prescriptions is close to one hundred percent.

**SW:** Do you obtain all that data?

**AN:** No. We do not know everything. We extract data from every prescribed medication we know about. People can also buy medication without a prescription. Adverse reaction programs for medication without prescription exist, but not in Estonia. We are developing single database to gather all types of medication. This is important for people who take many medications. Private companies can use this database in Estonia, but the government wants to make it national. I think Sweden already has a national adverse drug reaction program.

**SW:** Yes. If you visit the pharmacy, a red light will warn you if cannot combine two types of medication. Would you say the digital prescriptions are a success?

**AN:** Yes. It is a very successful project. It is convenient for patients to immediately receive their prescriptions from their doctor. All you need to do is call your doctor and ask for a new prescription or go directly to the pharmacy. At the pharmacy you receive your new prescription when you show them your identification card. For ordinary prescriptions, you do not need to show your identification card since anyone can buy this medication for you. However, we still register the people who buy the medication even if it is not that person who will take the medication. This is a problem since we do not know who takes the medication.

**SW:** Do you need an authorization to buy medication for others?



**AN:** No. You prove your identity and the pharmacist registers that you received the medication. However, we have seen problems of trust and with misuse of the system. It is impossible for the doctor to ensure that the people buying the medications will not use it for other purposes, even if it is prescribed to another person.

The fourth project of the eHealth Foundation focuses on digital registration. The central system has two main functions. The first function includes a central system for digital referrals. The second function uses these digital referrals to book patient visits online. However, the usage of online patient bookings is below the expected rate. The general interest in digital registration is low. I do not know why the hospitals show a low interest in digital registration systems. Perhaps, this is due to the fact that hospitals have their own booking systems. Hopefully in the future everyone will use the central systems.

**SW:** You have explained the four programs. Do these remain the mandate of the eHealth Foundation?

**AN:** Yes. The important program is the statistics system.

**SW:** How does that work?

**AN:** We are collecting health data in a structured way. We are using Health Level Seven International standard documents. We code and classify the data. We put restrictions on data and depersonalize entries. We replace names and identification codes with other codes to make it secure. Anonymization is important. Then you can extract whatever statistics you need. You can look at medications, diagnoses, and health problems.

**SW:** Can you view the performance of every doctor? Can you ask how many patients the doctor seen? How many of those patients the doctor diagnosed? How many prescriptions the doctor ordered?

**AN:** We use a separate system for medical prescriptions. We could improve this system because it is far from perfect. The system is managed by the Health Development Institute.

**SW:** What is the Health Development Institute?

**AN:** The Health Development Institute manages national health data. They send data to international organizations. They look at health prevention. They advise the Ministry of Social Affairs on how to allocate money.

**SW:** You have a department for statistics at the eHealth Foundation. How many work with the national statistics?

**AN:** We have two people in our statistics department. At the Health Development Institute, there are around ten people.

**SW:** Please describe the eAmbulance system.

**AN:** The eAmbulance system is an emergency response team that we manage digitally. We manage the information technology part of the eAmbulance, not the entire ambulance service. Each emergency vehicle is equipped with an iPad. The eHealth program runs on the iPads. Emergency personnel obtain patient information while they work in the field. The staff can use the personal identification card to extract information. The police and the firefighters use a similar system. We are starting to work on travel optimization.

**SW:** The information technology part is important. If you are in the ambulance, can you extract data from the central system about a patient?

**AN:** Yes.

**SW:** How would you improve the eHealth system?

**AN:** The important part is to develop the local systems. We need more robust local systems and work processes. We need to put greater emphasis on local excellence.

**SW:** When you say local do you mean one hospital?

**AN:** Yes. Every hospital counts. We need local systems that help with management. There is a great different between the local systems. Some are great, while some need improvement.

**SW:** What weaknesses do you see when you look at the local systems? What components do you need to improve in the processes?

**AN:** An effective information exchange system is critical. People who use the systems need technical support. We should establish help desks. These desks are especially important in the beginning. You need substantial support in the implementation phase. Even if a person only needs to push a button, you need to show them which button to push.

**SW:** Does your eHealth system mean that healthcare professionals double document anything? Do they use their own system and your system, or just one?

**AN:** Our system brings a bit more work. Healthcare professionals make a summary in our system. They select the important information. The patient can see the summary through the patient portal.

**SW:** What is the purpose of the summary? Is that for the government?

**AN:** No, it is not for the government. The summary is for the information exchange. It is a summary that can be used by other providers. It is the opinion of the doctor. There is also a statistics part to this summary. In one query, you can obtain critical information about the patient through the summary.

**SW:** What else would you improve in your work?

**AN:** We lack historical patient data. We have no patient data prior to 2009. Doctors may leave some parts out in the summary. Perhaps other physicians may have liked to access that data.

If a doctor does not enter data, we have no data. We frequently add new data to our standardized data collection system. In the past, some data entries were not standardized. For this reason, the data is incomplete. As we are considering a distributed infrastructure, we are thinking about ways to circumvent this problem. When someone has a query, we can search the whole healthcare system for this extra information.

**SW:** In the distributed system, one hospital can ask another hospital for the information.

**AN:** Yes.

**SW:** How much do you invest to convert this to a distributed system?

**AN:** We have calculated that it will cost us fifty million Euros or around fifty five million US Dollar. So far, we have spent around twelve to fifteen million Euros.

**SW:** It does not seem a lot of money.

**AN:** No. We are still working on the central parts. We have not estimated the local costs. We believe that the total cost will be fifty million Euros.

**SW:** What is your yearly expenditure on information technology as a fraction of your total healthcare costs?

**AN:** We spent three million euros in 2013. This figure has remained fairly stable.

**SW:** Are there any other parts that you would like to go through that would help me understand the architecture?

**AN:** Yes. The foundation of the architecture is the link to the national population registries. When patient documentation arrives, we verify that the person is an Estonian citizen and that the doctor has a valid license. We block the query if the doctor lacks a valid license. It is live query. Patient documentation arrives after the doctor makes an inquiry. The inquiry synchronizes with the central national system.

**SW:** Do you use Anatomical Therapeutic Chemical codes for your medical prescriptions, so that you can keep track on prescription rates? The codes are used to classify active ingredients of drugs. I know that the system is controlled by the World Health Organization.

**AN:** Yes. The Anatomical Therapeutic Chemical codes identify groups of medicines. The coding system helps us keep track of prescription rates. This is a system from the Nordic countries. We are not allowed to prescribe medication from companies that do not declare chemical codes. When a patient purchases medicine from the pharmacy, the pharmacist must recommend the cheapest medication.

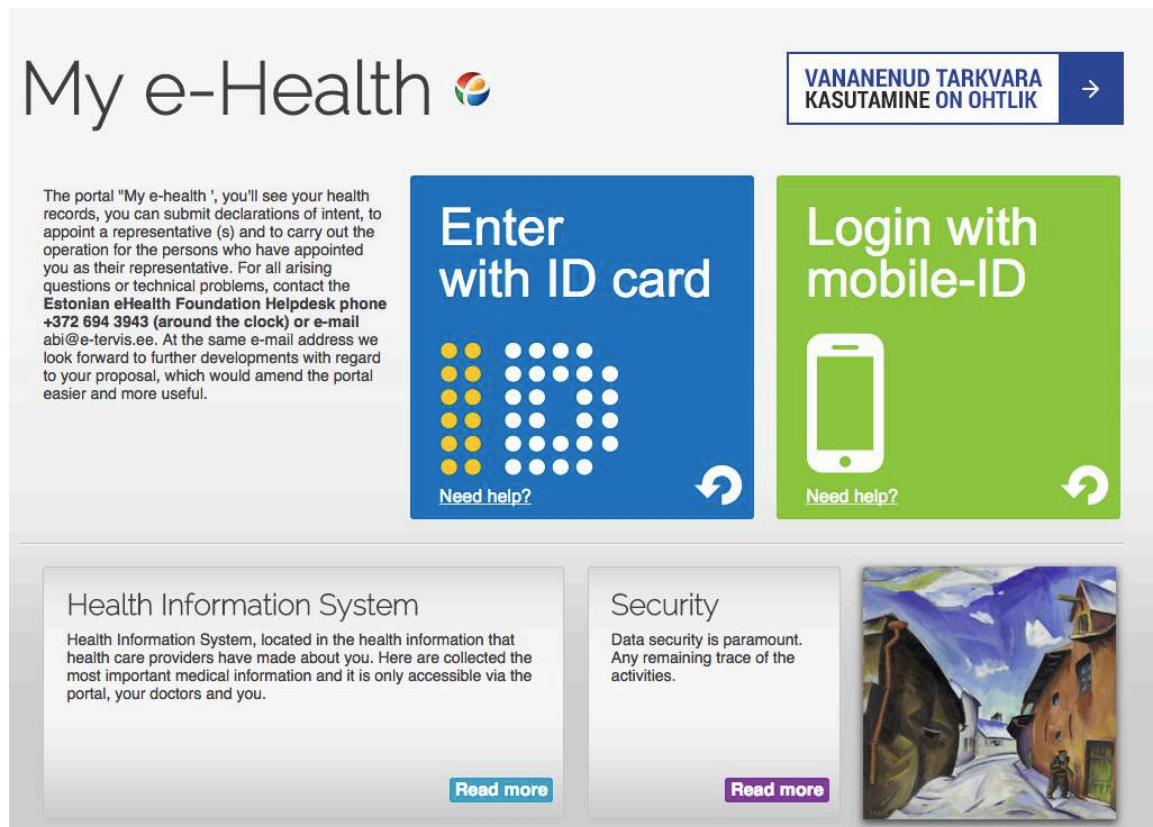
Another important feature of the eHealth architecture is the X-Road. We launched an X-Road project. The aim of the X-Road project was to develop software, hardware, and organizational methods for standardized usage of national databases. The X-Road provides secure channels. We established this system in 2000. It was first established to allow different government systems to communicate securely. We have a system portal, which is a state component. We use the X-Road to establish secure channels to the private entities and to the hospitals. The eHealth Foundation manages the security.

The X-Road is a security service. Every data store must have a security server and a portal. For example, if a doctor sends information through a well known protocol, the information is encrypted from one security server to the next. We use centrally matched certificates to identify the individual or organization that sends the information. The certificate provides knowledge about a local system. It

is mandatory for these hospitals to use this security server. This allows us to identify external individuals who have no right to access the data.

**SW:** Can you show me the Patient Portal?

Below is a screenshot of the Estonian Patient Portal.



**AN:** As you can see, you can log in with your identification card, using your identification card reader together with a pin code and a fourteen digit personal number. Anyone who wants to use his or her identification card, must have some kind of identification reader. If you want to use our eBank services, you use the same card reader.

**SW:** How do the two keys work?

**AN:** We have two private keys: one for signature and one for identification.

I will show you my Patient Portal. Here, you see that I am insured. Here, you see the name of my family doctor. I can give access to my patient information to other family members.

**SW:** So you can see other family members' as well?

**AN:** Yes. Here you can see my wife and my two daughters.

**SW:** Is that automatic or do you need to agree?

**AN:** Family members are connected in the population registry. You cannot obtain access to your wife automatically, but you can access your children.

**SW:** And your parents?

**AN:** No. You cannot access you data unless they explicitly approve. The system is transparent. In the Logbook, you can see who has accessed your patient record. The Logbook shows the names of the doctors. The Logbook also details my correspondence history. At one point, I requested some documents from my doctor. At another point, I obtained the results from an X-ray. I had the X-ray at the West Central Tallinn Hospital. The hospital sent my results to my family doctor. I could view these results. I talked about health insurance and the National Health Insurance Fund previously. I would like to mention that patients here can see if they are insured through the Patient Portal.

**SW:** That creates trust in the system.

**AN:** You can close down your documents if you do not want the doctors to see something. You can close down your whole record or you can close down individual documents.

**SW:** Why would you want to do that?

**AN:** There may be a number of reasons why you would want to do that. You can also choose for whom you close your record.

**SW:** What else are we looking at here?

**AN:** If you follow this link, you see your main health information. From here, you can consent to blood transfers and organ donations. You can see your medical certificates for your driving license. You can see your reported health status. You can view your prescriptions, vaccinations, and immunizations.

**SW:** If you go somewhere and take a vaccination it will show up here?

**AN:** Yes.

**SW:** Can you see all your medications?

**AN:** No. It only shows your active prescriptions. However, you can access your prescription history here, but you only see prescriptions from 2009 and onwards.

**SW:** If you are born today, will you store this health data for your entire life?

**AN:** Yes. It is mandatory to store this in the central system for 110 years after birth. Then we can delete it.

**SW:** Do you need powerful servers to store this data?

**AN:** No. We have twenty terabytes of storage. The database uses three terabytes. We had six to seven terabytes, but we have done some optimization.

**SW:** What if the population of Estonia doubles? Can you manage with a larger population?

**AN:** Of course. A doubling is not a problem. If the population will be ten or one hundred times larger, the central system will be inefficient. Perhaps, we will have hard drives in the future.

**SW:** Is the hard drive the problem?

**AN:** With large amounts of data, the hard drive becomes a problem. The physical part of the information system becomes problematic. There are systems in which we are imputing larger bytes of information, while they are still possible to manage. These use oracle databases, which are standard.

**SW:** While we are looking at the Patient Portal, may I ask you about appointments. Can you book an appointment with your doctor at the Patient Portal?

**AN:** No. You cannot do that today. We have been talking about adding this function. We had such a booking system in an older version of the Patient Portal. We have not done it for this version. We have links to the hospital booking systems. You can go through their websites and book an appointment.

**SW:** Can you see future appointments on the Patient Portal?

**AN:** It depends on the hospital. When I go to my dentist, they send me the estimates. It was convenient, but it depends on the system. However, we have



discussed how to make this service available for all future appointments on the Patient Portal.

**SW:** What is the main advantage of the Patient Portal for the individual?

**AN:** I forgot to mention that you can add commentary in your Patient Portal dashboard. This is an advantage if you are feeling sick and want to report your symptoms to your doctor. The doctor can then report the medical records after your notes.

**SW:** Is this medical record also sent to the insurance company?

**AN:** No. The insurance company only receives the diagnosis and necessary patient information. We leave out the opinions of the doctor and patient. The insurance company uses the documentation for reimbursement. Sometimes healthcare providers cheat the insurance company. They state that the patient had a certain diagnosis to receive a higher reimbursement.

**SW:** Is it difficult to audit this?

**AN:** The insurance companies must audit this themselves.

**SW:** In the future, you could just extract information from the patient record and send it to the insurance fund. It would make it easier.

**AN:** The problem is that doctors may report different diagnoses. If we check the patient record, we may compromise the data in the patient record. You do not want to mix these two types of documentation.

**SW:** What if I discover a mistake in my patient record online?

**AN:** Managers of the central system cannot change mistakes. Once the patient record has been digitally signed, the information is locked. This is a safety measure. Patients must call or email the doctor to change this information.

**SW:** In Sweden, patients discover mistakes in their patient record online.

**AN:** We do not have this kind of feedback mechanism yet. We list the contacts to the doctor. You can contact the eHealth Foundation and notify them of mistakes. Sometimes patients discover that they have access to someone else's patient record and not their own. The problem lies with the local system. When the doctor imputes the identification number, the doctor sometimes selects the

wrong patient. We can correct these mistakes through the central system by changing personal identification numbers.

We also have a Doctor Portal. Doctors log in and see all their patients. I am not sure how the Doctor Portal looks since I do not have access. Doctors see diagnosis groups, classifications, dates, and a range of other type of information. Many doctors use their own systems for patient records. We mandate that those who lack an in house system must use our system. The usage of the Doctor Portal is quite low.

**SW:** Their own systems can upload information to the central system.

**AN:** Yes.

**SW:** Do you think the usage of the Doctor Portal will increase in the future?

**AN:** We do not need the Doctor Portal. It would be better if providers had good local systems.

**SW:** What are the greatest strengths of your information technology infrastructure?

**AN:** We can extract national statistics. We can integrate services across departments. In the future, we can develop advanced decision support for doctors. We can make decision support systems precise, based on our national statistics and infrastructure. We can link our technologies to the Estonian Genome Center, which works on personalized medicine. If you bring human genome information, you can predict the success of treatments and improve health outcomes.

In five to ten years, we may integrate healthcare statistics with environmental indicators. This can improve our predictive capability. We will be able to analyze how environmental factors impact health on a national level. We have a number of integrated services. When you apply for a gun in Estonia you need a medical certificate. This is an integrated service that we offer. Your medical record is sent electronically to the gun shop. Electronic certificates are safer than paper copies that you can lose and replicate.

The next step is to provide decision support systems to patients. Support systems can make recommendations about suitable diet, exercise regimen, and other lifestyle choices to patients based on their conditions. Patients can access this in

their Patient Portals. We could integrate genetic risk assessments to help patients manage their health.

**SW:** In Sweden, the elder care sector uses a separate patient record system from the hospitals. Is that how it works in Estonia?

**AN:** It is the same here. Our elder care sector is not as developed as your elder care sector. We want to integrate our social care records with the healthcare records. Our social care records are basic. We work to improve information about people who live with disabilities. We try to assess their capabilities and send that information to various governmental agencies that are involved in their care. In elder care, we provide an emergency alarm service for seniors.

**SW:** Can hospitals share information with homecare services?

**AN:** The homecare services lack automatic access. Doctors can open the records and share information. We need to update constantly the laws to allow for information exchange. Changing the law takes time. It is an advantage that representatives from hospitals, medical associations, politicians, and administrators from the Ministry of Social Affairs serve on the board of the eHealth Foundation. This gives us an opportunity to build consensus and understanding around the legal requirements of an eHealth system. We obtain funding from the Ministry of Social Affairs and from the government of Estonia. We need board permission for everything we do.

**SW:** How are the eHealth systems of Latvia and Lithuania?

**AN:** Latvia that is trying to develop an eHealth system similar to ours. I recently spoke to the chief architect, who said that they would launch a central system in the beginning of 2016. I believe that Lithuania is also working to improve their system.

**SW:** Thank you, Mr. Novek! That was a long and detailed description of the work of the eHealth Foundation. I am most grateful that you wanted to share this with me.

**AN:** Thank you, Sofia! Welcome back to Estonia.

## Interview with Taavi Kotka, Ministry of Economic Affairs and Communications

### *About Taavi Kotka*



Taavi Kottka is currently the government chief information officer and deputy secretary at the Ministry of Economic Affairs and Communications of Estonia. Mr. Kotka has a Bachelor's of Science in Engineering and Information Technology from the University of Tartu. He received his Master's of Science and Engineering at Tallinn University of Technology. Mr. Kotka previously served as the chief development officer and, later, chief executive officer at AS Webmedia. He has also served as a member of the board at NORTAL. From 2009 to 2013, Mr. Kotka served as the president of the Estonian Information and Communications Technologies Association. He is an angel investor in promising startups.

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### *Interview*

**Taavi Kotka (TK):** Everything is information technology and communications in Estonia. I work with policymaking and investments in Estonia. I have the same title and responsibility as the Minister of Social Affairs on eHealth. I am seen as a key player in information and communications technology in Estonia.

If you want to talk about eEstonia, I am the right guy. eEstonia is the way we refer to our eGovernance system. eGovernance is a collective term that describes digital services from the government. As a entrepreneurial communication and software engineer, I know quite a lot about digital services. I founded the largest software development company in this region. I had 650 employees. Then I sold my shares and started working for the government.

**Sofia Widén (SW):** Will you go back to the private sector?

**TK:** Yes. I will definitely go back, I still need to earn some money. However, I cannot complain. The things we are doing are great at the moment. There are four issues that are on my table at the moment. All of them are path finders. A path finding role means that I am responsible for developing new services and finding new paths where there is no previous experience. No one else in the world has ever done it.

**SW:** Are you still an entrepreneur?

**TK:** I am also a PhD student. I am changing the world from a scientific point of view.

**SW:** Are you pursuing your doctoral studies?

**TK:** Yes. In software engineering at the University of Tallinn.

**SW:** Do you combine that with your full time position in the government?

**TK:** I have been a software engineer all my life. For me, the lectures in school are nothing new for me. I was recognized as the best chief information officer in Europe last year and I have been “Entrepreneur of the Year” in Estonia.

**SW:** You can retire now.

**TK:** More or less, yes.

**SW:** When you are looking at your current position, you say there are a number of areas where you find new and innovative paths. Can you talk a little bit about those areas what they are?

**TK:** We are creating a country without borders. This is a conceptual idea. We allow people to become eCitizens, even though they do not live in Estonia. We break down the borders through eCitizenship. We have no legacy policy. A legacy policy is a policy that is difficult to change because it has been a policy of the past. That is something that all the Western Europe countries and the United States are struggling with. We try to overcome this by thinking about new policies.

**SW:** How much do you spend on your eGovernance system?

**TK:** Our government budget for information and communications technology is forty times that of Finland, even though there should not be any reason for that.

A smaller country does not need to spend more than a larger country. However, we have focused on digital infrastructure.

In terms of digital, we are the same size. There is no difference if you have ten million or one million people. You in Sweden are a bigger nation, with an independent electronic banking system. Sweden and Estonia could spend equal amounts of money on their electronic banking systems. Our populations differ, but it should be irrelevant.

Here in Estonia, we are a small country. Estonia is smaller than Sweden, but why should a smaller country have a weaker eGovernance system than a larger country? When I say eGovernance systems, I refer to the digital services that we offer to our residents. Our systems should be equal. Our hospitals are equal. Sweden has more hospitals. That is a question of numbers, not of quality. In eHealth, Estonia and Sweden can use similar systems, for three million people or for ten million people.

**SW:** Are other countries less efficient?

**TK:** Yes, but you have legacy. That is why we have no legacy policy. We do not allow legacy to take control.

**SW:** Were you one of the pioneers of the eResidency program?

**TK:** Yes. I am one of the founders. The eResidency program allows foreigners to apply for a card to become an eResident. This is not a full citizenship. This program allows a person to start a company in Estonia and benefit from certain other government services.

**SW:** Can you tell me more about that? How would that work if I want to become an eResident tomorrow?

**TK:** You are here in Estonia at the moment, so you can go to any police station. You can also apply over the Internet. You pay your fee. Then you need to approach the closest Estonian Embassy and provide your fingerprint. Once this is done, you get residency in Estonia.

**SW:** Can I vote in your elections then?

**TK:** No. You do not live here.

**SW:** What are the advantages? I can start a company here?

**TK:** Yes, you can open a bank account. All private sector and public sector services will be available to you. eResidency is a key that opens all the service portals in Estonia, except voting. How you use your eResidency is up to you.

You can even open an Estonian bank account in Sweden, which you can use over eBank.

**SW:** What nationalities apply for eResidency in Estonia?

**TK:** Various nationalities. It is not a citizenship. It is not even a visa. Having an eResidence does not allow you to come to Europe. It is a digital identity. We have taken fingerprints. We have done a government check and facial recognition. We authenticate the person on a high level, compared to what the bank is doing. We are more secure.

**SW:** How many people have used this?

**TK:** We just started, but maybe about 3,500 have used it so far. This is a substantial amount for us already. At ten thousand, eResidence will start to have a significant impact on the Estonian economy. eResidency is an opportunity. You never know how far you can take it.

**SW:** What are the advantages for Estonia as a nation of offering these kinds of services? Tax receipts?

**TK:** Not taxes. It is simpler. Estonia is not an offshore country. It is easier to cheat at taxes in Sweden than it is here. We have the toughest money laundering law in the world. However, our economy is decreasing. We have a negative birth rate. Our population is yearly decreasing by five thousand people. At the same time, we always want to be wealthier and catch up with Sweden and Finland. We have to invite people and find new trade partners. That is the basic rule of economy.

Immigration is not the solution. No one wants to come to Estonia. They either go to Sweden or Norway, because of social benefits. Estonia has no benefits. It is an obvious choice. We have a limit on how many immigrants can come to Estonia every year and we never reached that limit.

**SW:** What is the limit?

**TK:** The limit is 1,200. It is nothing and even that number has never been met. Even when we shared living permits with Russians, we never met the limit.

**SW:** Can we implement similar services in Sweden?

**TK:** Yes. You could implement a similar program, but you do not have the courage in Sweden. The whole world is doing it.

Upgrading your technology is a normal development. It is normal to change your computer after a few years. Apple provides new software every three months and they drop the old software. They do not support them anymore. Windows XP is the most used operating system in the world. Apple does not support the old operating systems of Windows XP.

**SW:** Why do you use a system that is not supported?

**TK:** It is a legacy, and it is costly. Ninety percent of your government information technology budget goes to legacy. Finland still has core programmers using a language that was invented in 1959.

**SW:** How do we get there?

**TK:** You need the right policies. Most eHealth systems in Estonia were built in 2004. I was also an engineer at one of the largest hospitals here in Estonia. In 2004, made the first data model and other systems for them. There were no voice recognition nor touch screens in 2004. Data storage was expensive. Today, user habits changed and people want to do voice recognition. Data storage costs nothing. We have studies that show it is more efficient and less costly to upgrade to a new system.

**SW:** How often do you phase the old systems out and upgrade?

**TK:** Systems are updated within thirteen years. It might be sooner, but it cannot be longer. This policy is only for meaningful systems. For example, we have a very old service where I can apply for a fishing permit. Even if you fish every day, you must apply for a new permit for each fishing trip. You just send them information and automatically get a fishing permit. For those kind of services you do not need that policy. It does not work, but for an eHealth system it does.

**SW:** Do you integrate these services across the government or do you have different silos?

**TK:** We need to have silos. Every ministry is responsible for their information, but they exchange data. Swedes are extremely good at faxing and using old



systems. I admire your efficiency of the fax and paper system. In Estonia, everything is automated.

**SW:** Compared to Sweden, what are the greatest benefits for citizens of your eGovernance system?

**TK:** In Estonia, queues do not exist. I must teach my children the meaning of a queue. If there is ever a queue, it is because something inconvenient has happened and there will be a huge debate in the news. Reporters will say “Look at those idiots”. Social pressure is huge. The government needs to prove itself.

**SW:** What are the other advantages of eGovernance?

**TK:** I think it is more transparent. We should not compare us to other Nordic countries, because we are all the same type of countries. If you look further south, the transparency level and the corruption level are different. It is mostly because of information technology. There is no corruption in Estonia. Estonia is turning into a state that resembles Sweden. Sweden acquired their wealth for centuries. Estonia started after the occupation in 1991. Twenty four years has changed things. Technology prevents corruption. Our way of managing Estonia, can help us reduce corruption.

**SW:** This is a strong advantage of the eGovernance system.

**TK:** Yes. People accept that we run Estonia digitally. How we address data protection and privacy is different here compared to any other country in the world. There was a lot of value added tax fraud in our system. Our old non digital government tax collection system allowed some people to avoid value added tax. To fix that, all steering companies needed to declare their sales and purchases over one thousand Euros. The companies gave all their business secrets to the government. This shows the maturity of the companies and the information culture in Estonia.

**SW:** Why is there such a high level of trust in Estonia?

**TK:** Because citizens have seen the results. The problem of trust in the system is especially noticeable in Germany, in France, and in the United Kingdom. Estonian citizens talk about our eServices and information culture. Entrepreneurs have seen this working in the private sector, with eBanking, Facebook, and Instagram. Other countries struggle and show no progress with digital services. If you compare Sweden and Estonia, the major difference is the

use of digital signatures. We are the only society that only uses digital signatures. If you approach an Estonian with a business contract in paper, they are suspicious. Everything is digital.

**SW:** Even when you hire someone?

**TK:** Yes. I only sign physically when I have contracts with foreign companies. The rest of Europe has not seen the benefits of digital signatures. They have only seen governments struggling to spend money on huge reforms.

**SW:** There seem to be several advantages for companies in Estonia. For example, you see better market practices, less fraud, and more transparency. If everyone declares value added taxes, you have this better information in the market.

**TK:** If we see fraud, we can actively fight against it. For example, the value added tax income is the second largest source of income for the government. After introducing our digital anti fraud system, this income increased by twelve percent.

**SW:** Does your digital anti fraud system work for sectors that handle a lot of cash?

**TK:** Everything that contains cash is a problem. We use this system for sums over one thousand Euros. Taxi drivers and hairdressers are not over one thousand Euros. We let them be. Today, most people pay with credit card. We plan to introduce a cash free society.

In Finland, you can only pay with credit card. In Denmark, it is now allowed for shopkeepers to decide not to accept cash. Sweden also plans to get rid of cash. That is very good.

**SW:** What would you change with your eGovernance system?

**TK:** If we have a smart idea, then we can do it. The problem is willingness to step outside of your comfort zone. I want all managers in the Estonian public service to take their job very seriously. However, the ministries do not care. They have other things to do.

A high commitment provides good service to the customer. In this case, the customer is the citizen. The problem is that one third of the government services are so rarely used that you cannot talk about customer experience. Services such

as paternity leave applications and construction permit applications need careful design. If the application is well done, you will have an easy experience.

**SW:** Do people use all different the digital government services?

**TK:** No. The services are too complicated. They lack customer experience. If your electronic banking system changes, it is a nightmare. The government portal is a poor service.

**SW:** Do you need a call center?

**TK:** You need a combination of a call center and online support.

**SW:** You said that in the future essentially, there might be a million different ways to use eGovernance. If you look five to ten years ahead in the future, what do you predict? How do you see these services being used?

**TK:** I see that businesses around the world will become more and more global. People are becoming more global. This will become a normal thing. Like a global world. Currently, most people use Gmail for their email account. Most people use YouTube as a video machine. Most people have Twitter and Facebook even though there are alternatives on the market. Most people use Spotify even though there are alternatives on the market. A global consumer choice exists. You are a global person, and you usually buy services from global companies. I think the same thing will happen with countries. People will buy services from Sweden, from Estonia, from Cuba, and from many other sources.

**SW:** Is that feasible? Are we dreaming a little bit here?

**TK:** I think it is already happening. We live in an information society. The things that are very accessible for a certain niche become globally available. You cannot stop that. It will happen. The question is how much are you behind.

**SW:** What is your greatest challenge with the system?

**TK:** The goal of the Ministry of Economic Affairs is to increase the wealth of Estonians. My focus is there. The value added tax reform is already carried out and saves millions of Euros every day for the government.

**SW:** Any other challenges that you see?

**TK:** We want to increase our population up to ten million. If we are successful, we will double our GDP.

**SW:** What do you see for healthcare services? What are you most proud of in the field of eHealth?

**TK:** I am most proud of our ePrescription system. I think has been elected as the best eService in Estonia for many years.

**SW:** Why?

**TK:** Medical prescriptions affect everybody, while digital signatures are only used for online services. Many elderly people only use digital signatures when they vote. ePrescription impacts everybody. Everybody needs medicine at some time. In most countries, you need to go to your doctor to renew a prescription. In Estonia, you can call your doctor for a renewal. The doctor will send the prescription digitally to the pharmacy. Research indicates that digital prescriptions can reduce the number of abortions. Some women may be uncomfortable asking for renewed contraceptive, while they feel less uncomfortable calling their doctor.

**SW:** Have you seen other similar changes?

**TK:** Yes. I have observed many changes. The normal thing is that people get well in hospitals, and they do not heal at home. People lack discipline. At the hospital, there is discipline. You need to take your pills. The ePrescription system reveals undisciplined patients. The doctor can view if patients collect their prescription at the pharmacy. Previously, if the patient claimed that the medicine was not working, the doctor might double the dose.

Technology allows us to put a chip in every pill. If you take it, the chip tells the computer that the pill was taken. In the future, doctors can follow the pill. I see that this solves a problem of poor medical adherence. You cannot cheat this type of system. Not only the doctor can see this information. Your family can also remind you to take your medication.

**SW:** Can your family login at your Patient Portal and access you information?

**TK:** Yes, if you give them access. In Estonia, all the hospitals are connected to the Patient Portal. If you go to the doctor, the doctor will see you medical history. You do not have to remember your last appointment. They have all the information.

**SW:** When will you come to Sweden and implement this system for us?

**TK:** I cannot. You first need a Patient Portal to change in the current system. Sweden has good communication platforms, social security identification, and electronic object identification. You need input from another system to create a Patient Portal. In Sweden, you could implement a similar system to the Estonian.

**SW:** Thank you, Mr. Kotka, for a most interesting interview.

## Appendix 1: National Health Insurance Fund, Estonia

Summary, full text copied from the website of National Health Insurance Fund, Estonia.<sup>5</sup>

The Estonian health system has come to be based on regulation and contractual relationships rather than subordinate relationships. Starting in 1991, the health system began a complete transformation. This year, the Health Insurance Act was passed and was shortly thereafter followed by the Health Services Organization Act in 1994. These two acts set out the legal framework for all subsequent reforms. First, the health financing system was transformed from a centralized, state run system to a decentralized, social health insurance model. Under this scheme, twenty two noncompeting funds were established across the country and were coordinated through the Association of Sickness Funds. A health insurance tax of thirteen percent of wages was established to fund the system. The next step in the reform process was to convert family medicine into a specialty with postgraduate training in order to train enough family physicians to cover the entire population. The aim was to establish family medicine as the gateway into the health system. The status of family doctors changed through time, so that by 1998, they had become independent contractors for the state. Thus, the strategic direction of the Estonian health system began to change.



Image illustrates the key features of National Health Insurance Fund, Estonia.

## Appendix II: Estonian Health Information System

### Slides

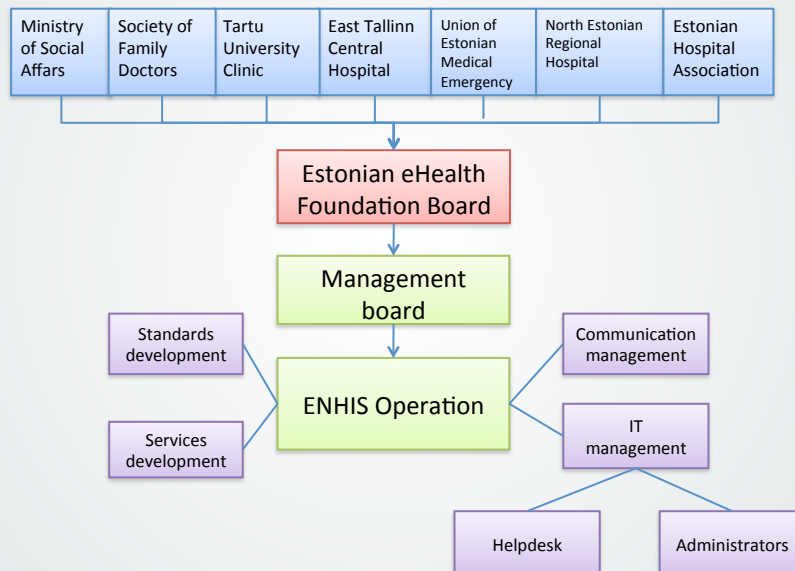
# Estonian Health Information System

Artur Novek  
Estonian eHealth Foundation

Implementation manager / Architect

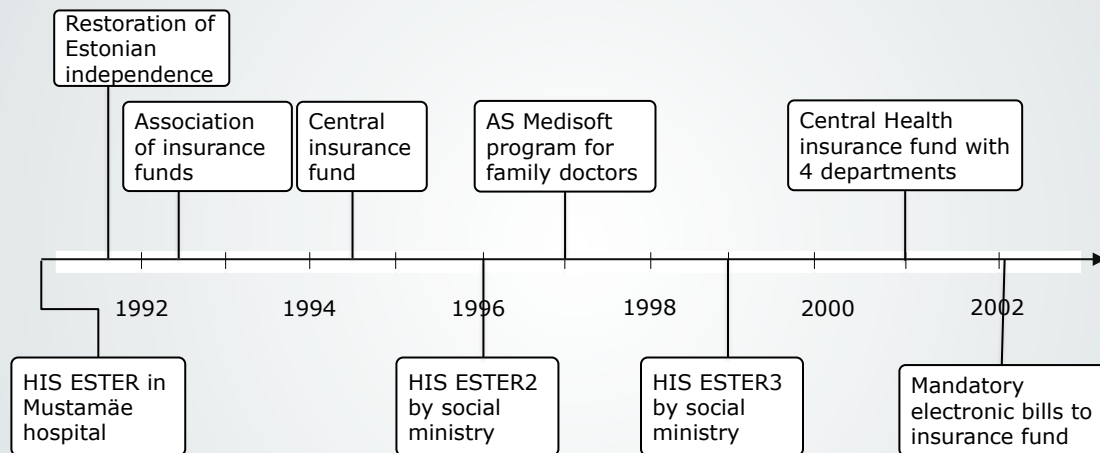


## Estonian eHealth Foundation organization



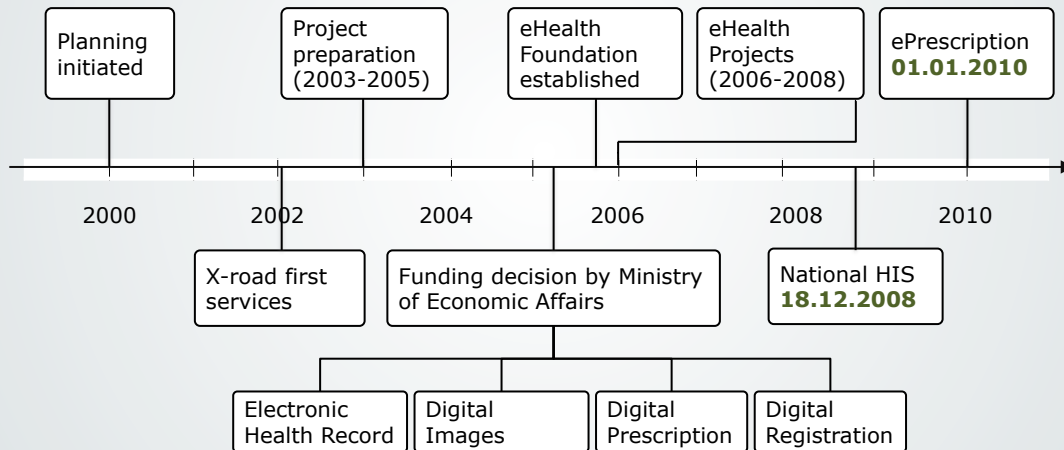


## 90-s. Local systems, focus on insurance bills





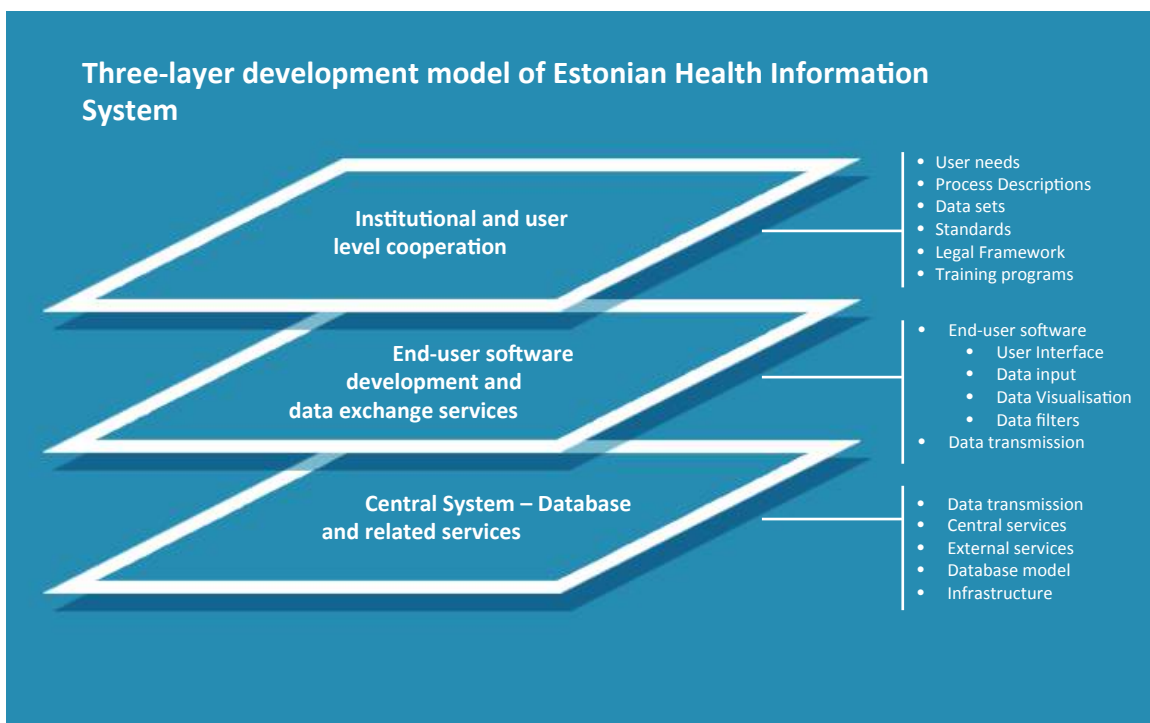
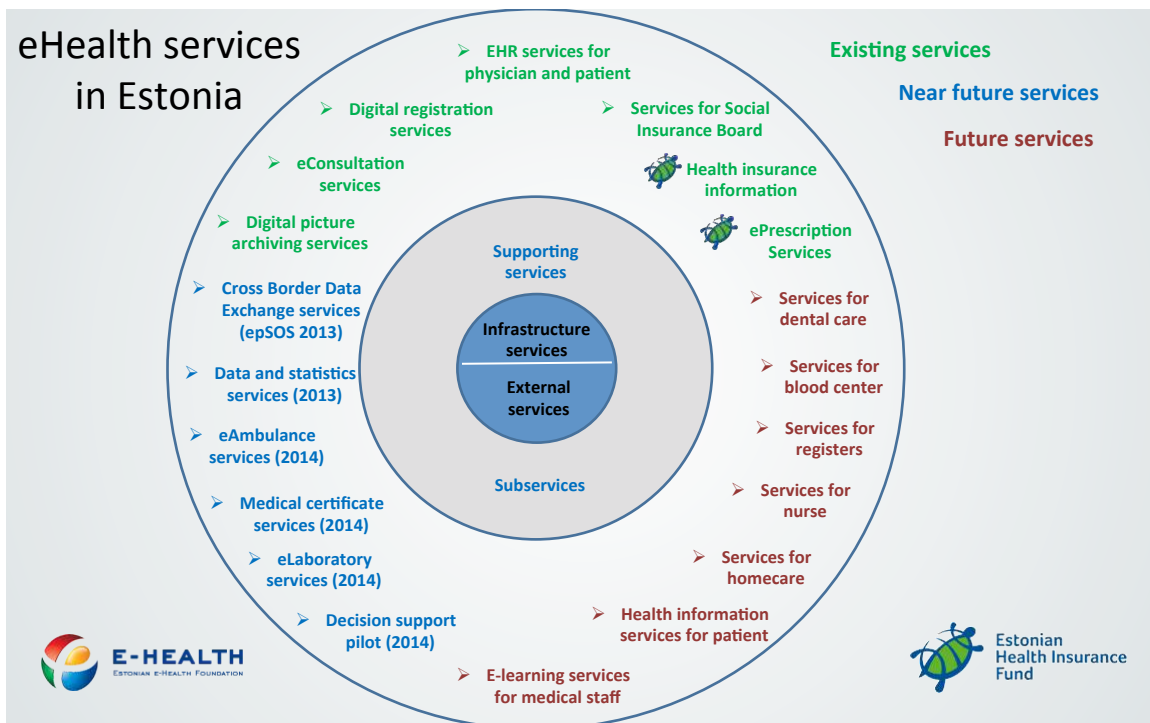
## 2000 – 2010 health information exchange, focus on health data



Estonian eHealth,



where  
are  
you?



Layers mainly mean that the bottom layers are the most rigid, not changeable, and the top ones are more towards the customer. For example, the storage of data on your computer is the bottom layer. The interface with which you are communicating and dragging your mouse over is the top layer.

## Major architectural decisions of Health Information System

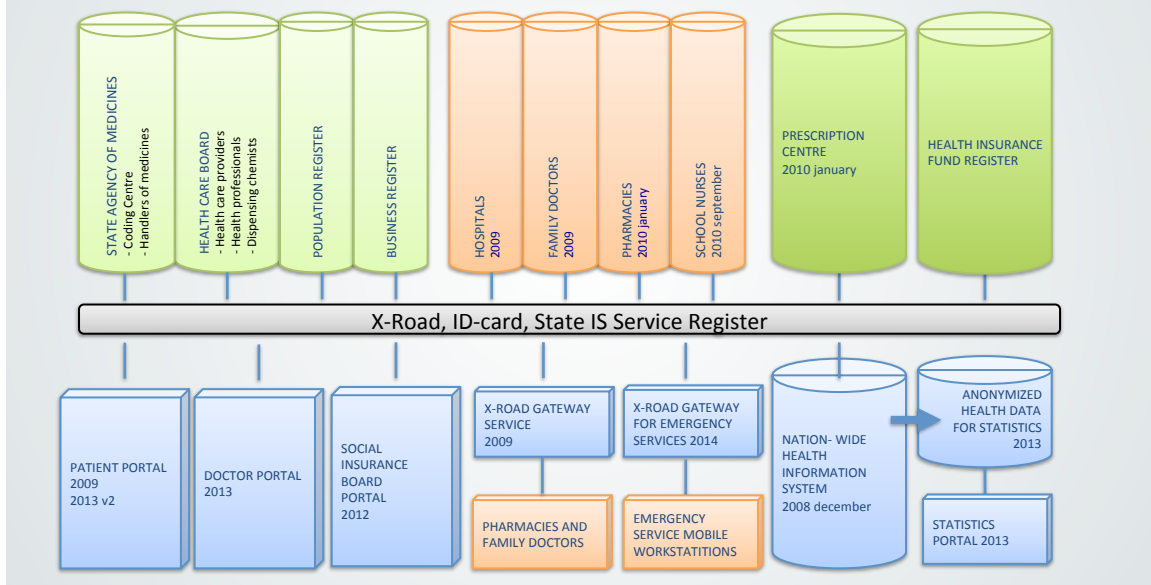
- Integration through Central system
  - Opt-out policy for patients
- XML based HL7 v3 (extended) messages
- Documents are kept in XML format (HL7 CDA R2)
- All structured data fields have OID-s
- Only final versions of clinical documents are sent into central system
- Reuse of national infrastructure
  - ID card for authentication and digital signature
  - Xroad for secure communication

Major points are the XML files. These are files that both humans and computers can read. PDF can't be read by computers because they are pictures, but word files can be read by the computer because these are types letters, which can be analyzed.

HL7 is Health Level 7, meaning international sets of standards for transferring data.

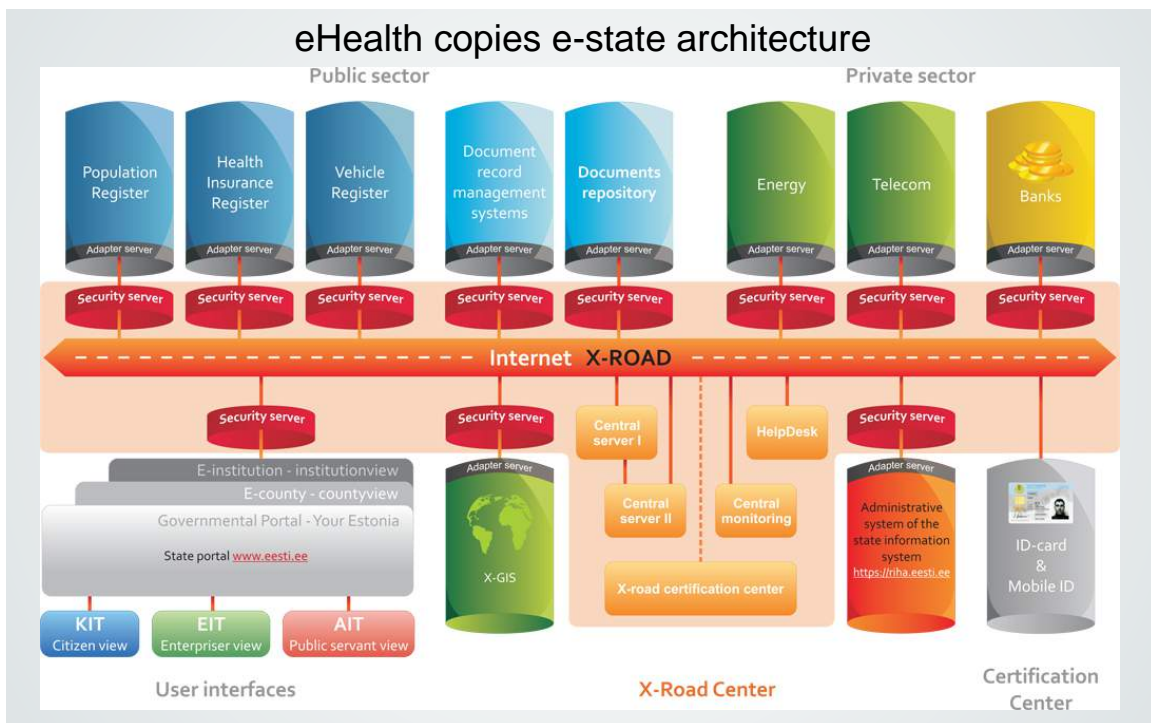
OIDS are Object Identifiers, making some objects (words, pictures, or other files) easier to find/group in a massive database.

## Estonian eHealth architecture

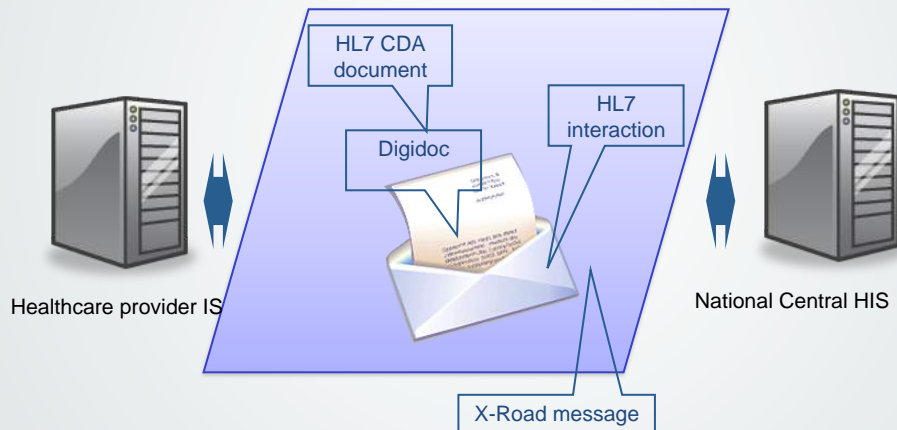


See X-Road. That is the bottom layer. The top layers of the system are more toward the bottom and the top.

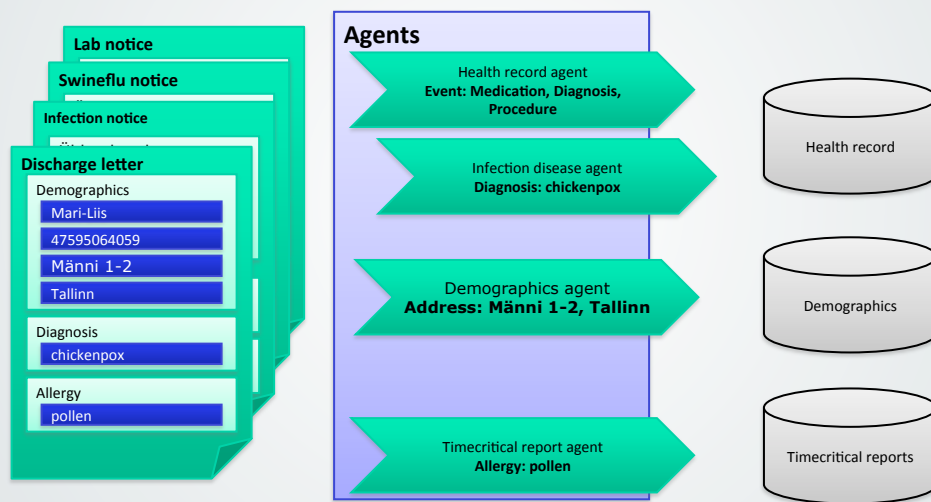
## eHealth copies e-state architecture



## HIS integration through X-Road

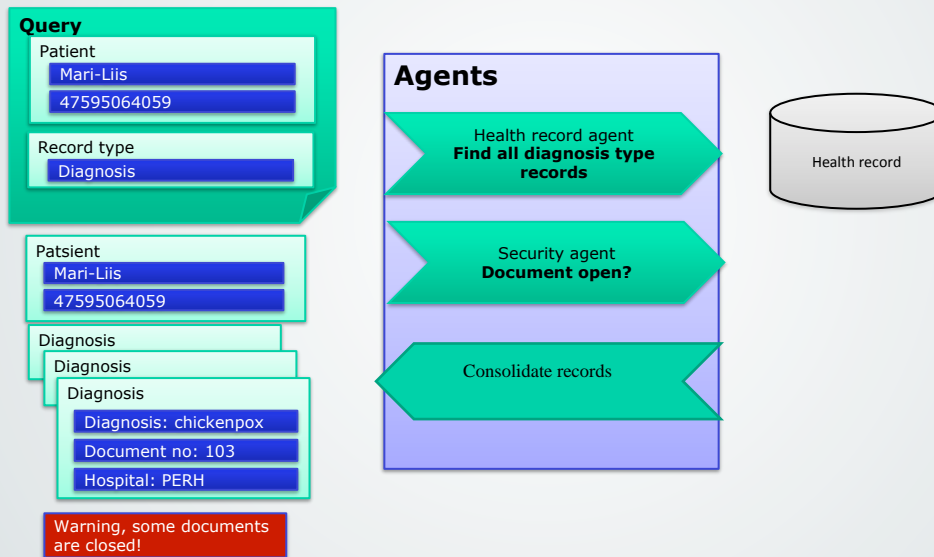


## Document processing

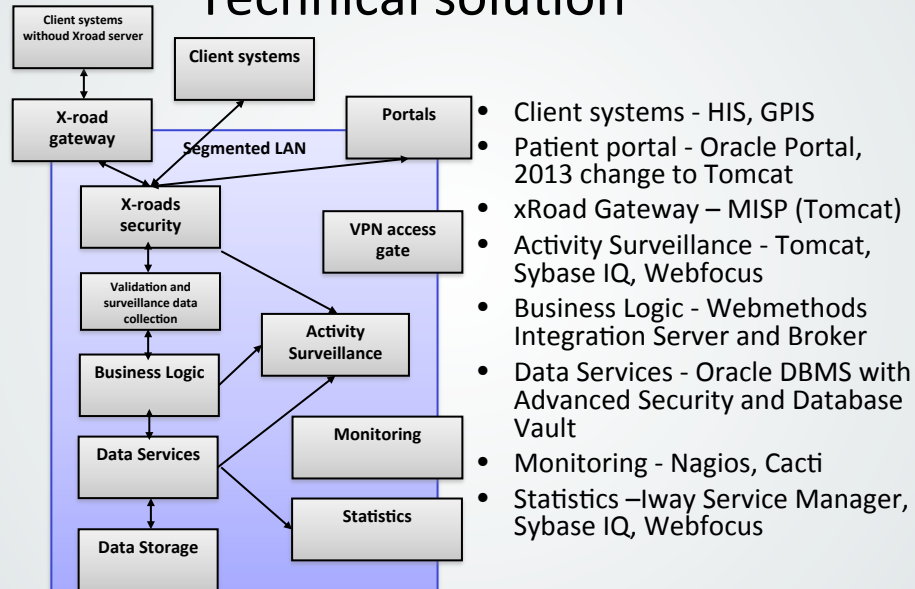


This slide and the next one display how documents and queries (requests for documents) are made. The silos on the right are databases, libraries of information.

## Query processing



## Technical solution



## SECURITY & AUTHENTICATION



### The 6 main principles “6 whales” of security of Estonian eHealth system

1. **A secure authentication** of all users with ID-card or Mobile ID
2. **Digital signing or stamping** of all medical documents
3. **A maximum accountability (transparency)**: all actions will leave an unchangeable (and unremovable) secure trail
4. **Coding of personal data**: separating of personal data from medical data
5. **Encrypted database** that allows to remove the confidentiality risk from the technical administrators
6. **Monitoring** of all actions together with the corresponding counter-measures (both organizational and technical)

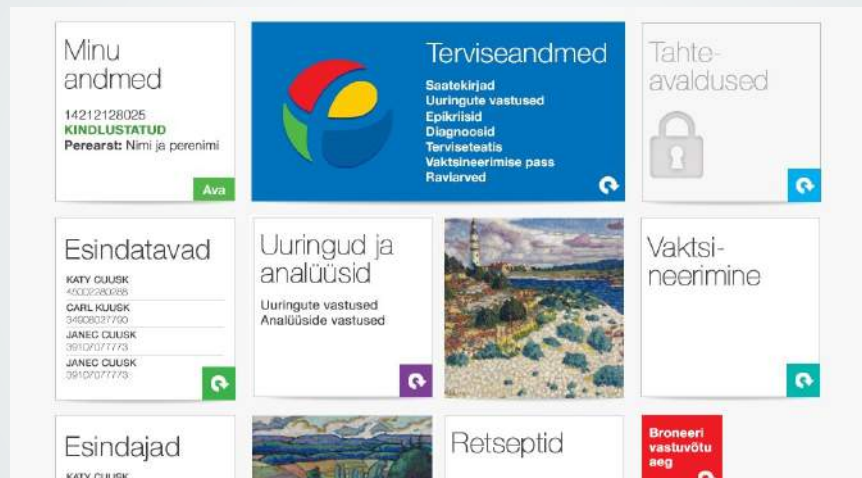


Security is a main issue. Main notes are the authentication – which verifies that the person who gets in is actually allowed and are who they are, for example by fingerprint on a smartphone – and the encryption – which makes it hard for hackers to get information concerning customers. For example, Google scrambles



all information from a person over all their data plants. Google moves the information daily. Google make it really hard to link accounts to actual people and what is in the account.

### Patient portal new design (live 2013 june)



### STANDARDS





## Standards

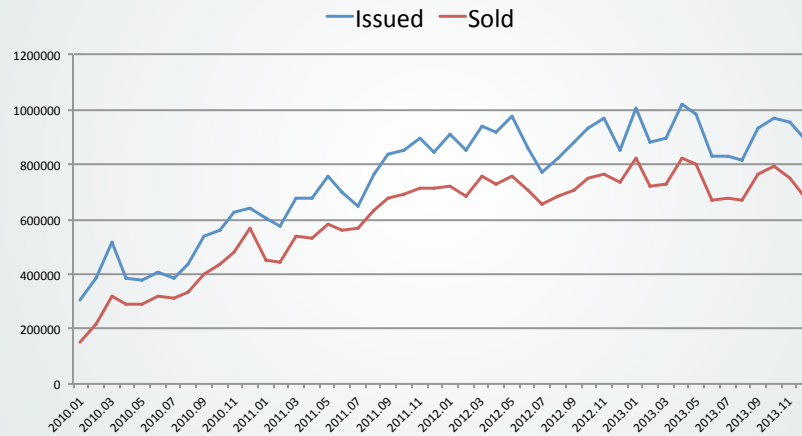
- HL7 and DICOM (Picture Archive)
- International classification: ICD-10, LOINC, NCSP, ATC
- Estonian eHealth's OID registry
- Local eHealth classifiers
  - Published in publishing centre
  - Classifiers are regulated by government act  
<https://www.riigiteataja.ee/akt/12910889>

## Acceptance

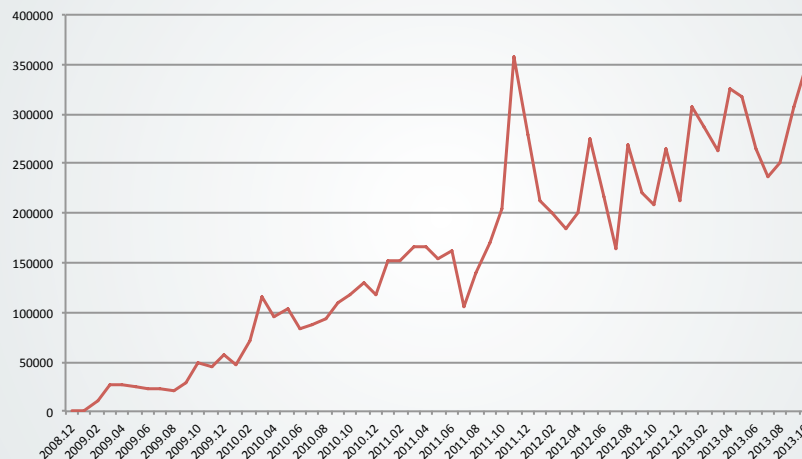
- ePrescription covers 94% of issued prescriptions.
- Over 90% of Hospital discharge letters – digital
- Over 95% of digital Hospital discharge letters are sent to HIS
- Ambulatory case summaries sending around 20%
  - No clear rules for sending ambulatory case summaries!
- 1 069 075 person have documents (82% of population)

21

## ePrescription (94% digital)

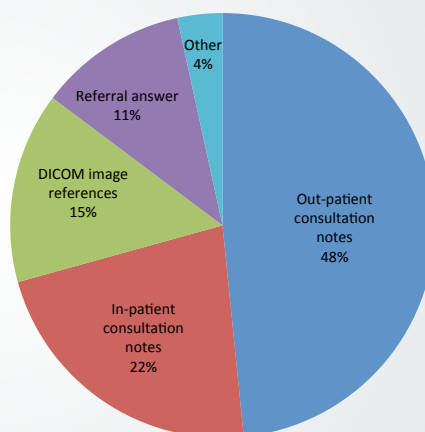


## HIS documents per month

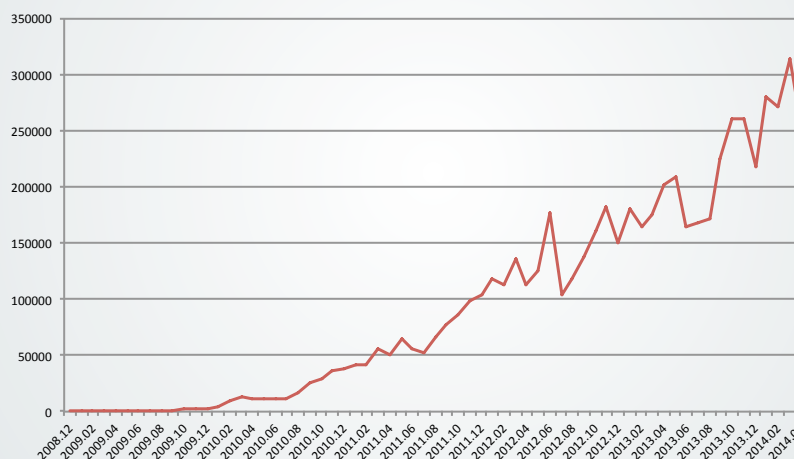


## HIS document count (24.04.2014)

Document type	Documents
Out-patient consultation notes	5 647 693
Referral answer	2 601 561
DICOM image references	1 697 336
In-patient consultation notes	1 322 440
Immunization notification	122 838
Day-care consultation notes	104 325
Children Health check notifications	96 498
Referral	47 923
Birth summary	26 742
Other	970
<b>Total</b>	<b>11 668 326</b>

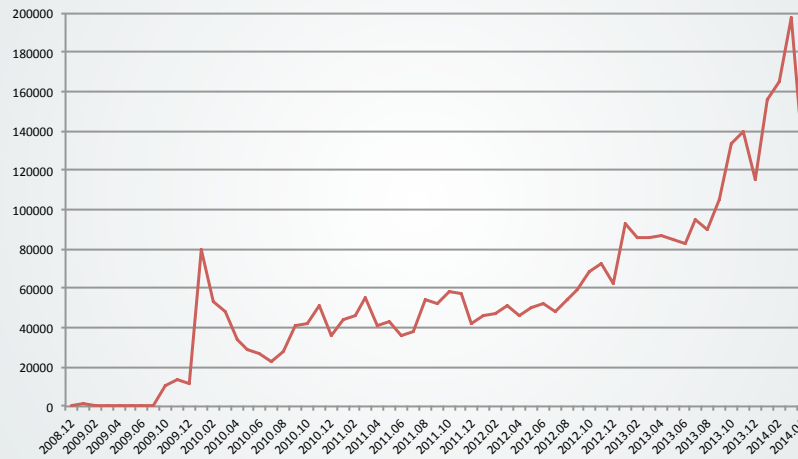


## Healthcare Professionals HIS queries per month

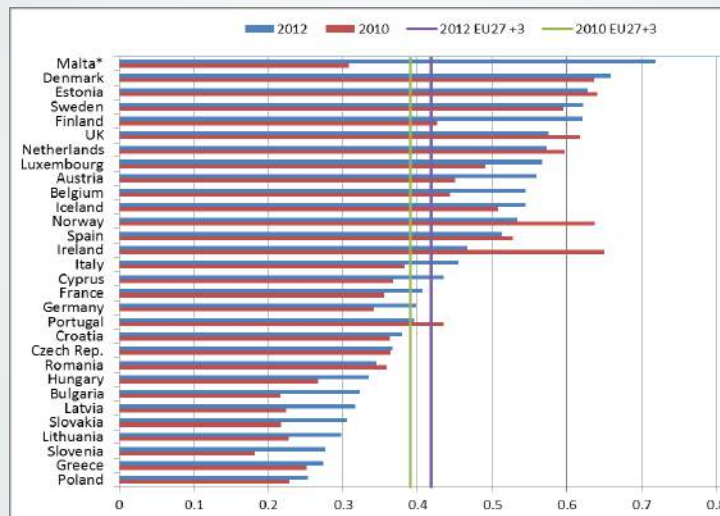


On this slide and the next slide, the queries are the requests for health information system (HIS) documents by healthcare professionals and the patients through their portal.

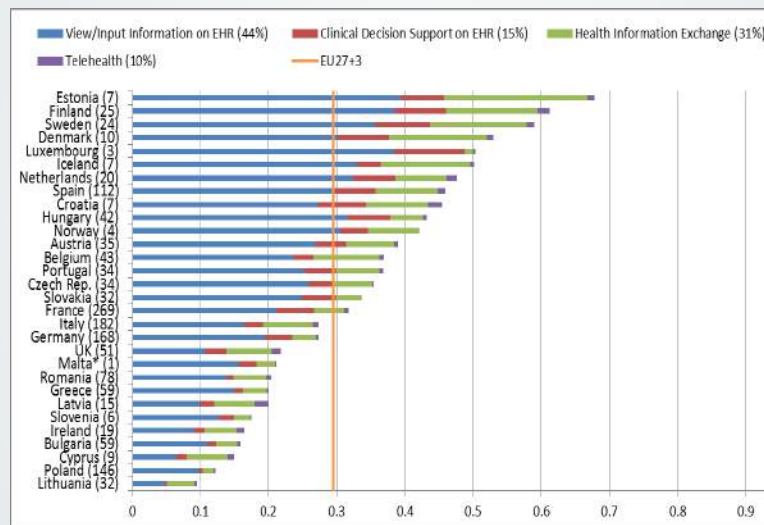
## Patient portal queries per month



### European Hospital Survey: Benchmarking Deployment of e-Health Services 2012 Deployment Composite Indicator – comparison with 2010 index



**European Hospital Survey:  
Benchmarking Deployment of e-Health Services 2012  
The Availability and Use Composite Indicator**



Estonian eHealth,

where

do you

get the

money?



# HEALTHCARE IN ESTONIA

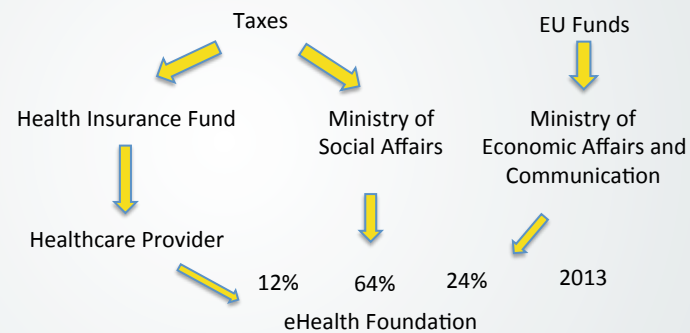
30 hospitals  
512 family doctors (juridical persons)

Healthcare expenditures 2012

- 5.9% from GDP
- 1030 mlj. EUR

## eHealth Foundation financing

Year	Expenditure (€)
2005	6 853
2006	259 944
2007	462 193
2008	1 009 156
2009	1 178 362
2010	1 433 602
2011	1 834 204
2012	3 048 636
2013	3 293 680



Without EU financing 1/3 from HCP-s and 2/3 from Social Ministry

# EU funded projects



## Estonian eHealth Foundation

- Electronic Health Record (1.6 mln €)
- Digital Registration (0.2 mln €)
- Digital Images (0.2 mln €)
- Activity surveillance module (0.4 mln €)
- Statistics module (0.4 mln €)
- Authentication and authorization module (0.2 mln €)
- eLaboratory (0.2 mln €)

## Health Insurance Fund

- Digital Prescription (0.24 mln €)

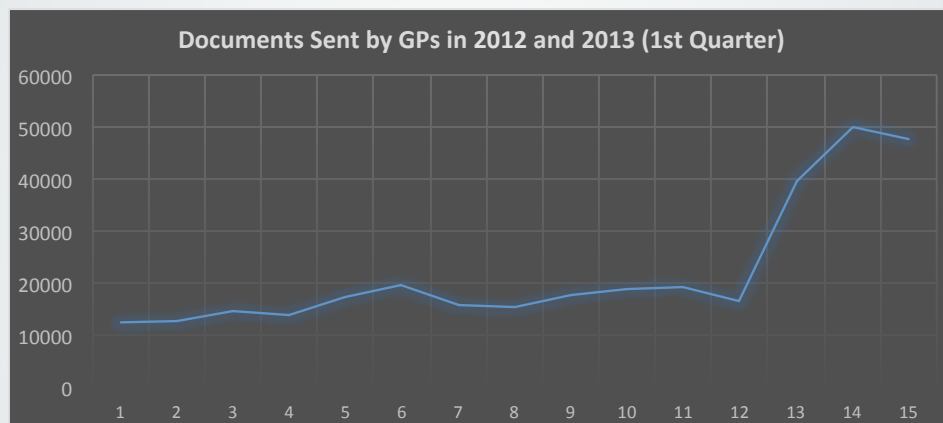




## Lessons learned

- Resources were planned only for central development.
- Usability. Developing process has to include medical competence – users
- Data quality is important
  - Complete and quality data give value
- Balance between security and usability
  - PIN for every document ...

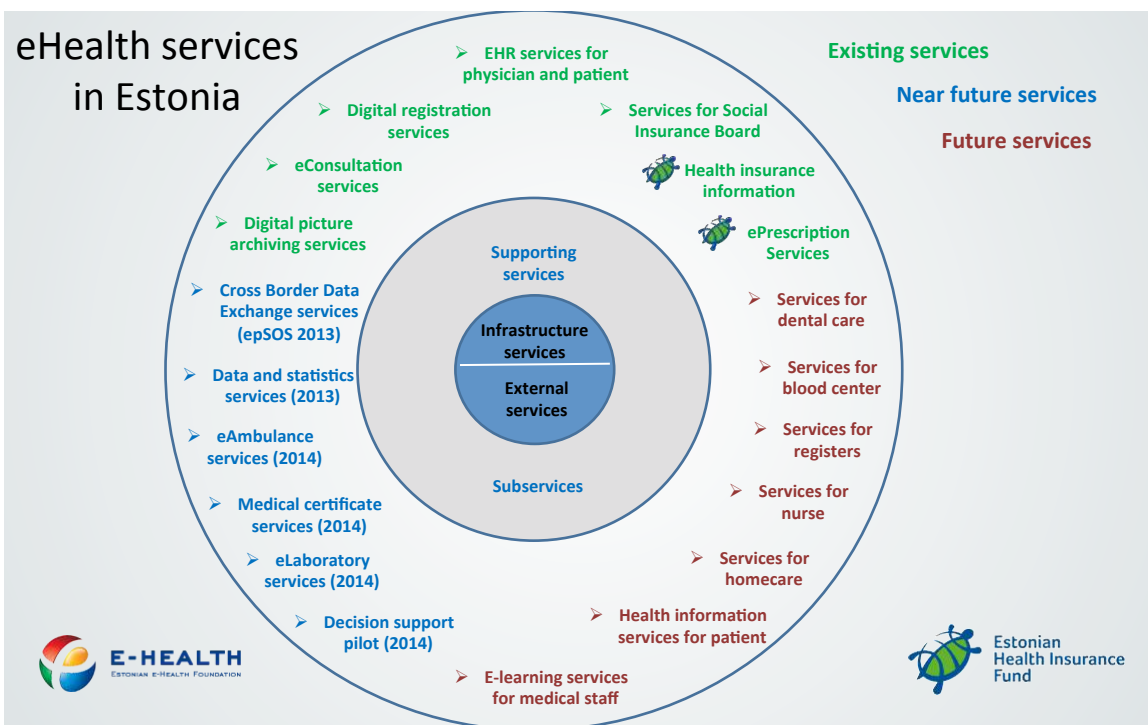
### Digital stamp for family doctors







Estonian eHealth,  
where are you  
going?



## Better services

- Faster data input
  - Voice recognition, statistics based text input assistant
- Faster and better output
  - Important information on “one screen”
  - Combining information from multiple sources
  - Graphical solutions
  - Precaching
- Single sign on



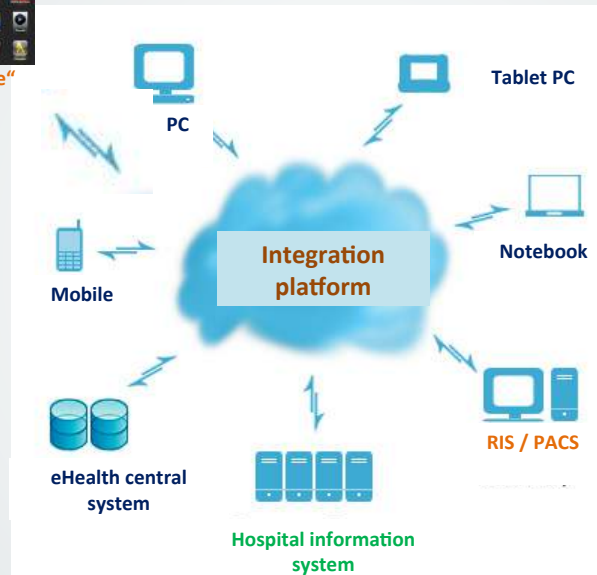
**Connecting health**



Connecting health



„App Store“



„App Store“



Connecting health



*Speciality based applications*

# Personalized medicine

... proposes the customization of healthcare - with medical decisions, practices, and/or products being tailored to the individual patient. The use of genetic information has played a major role in certain aspects of personalized medicine, ...



Over 50 000 donors  
in database

Combining information from these two  
systems creates possibility to develop  
personal medicine applications.



Over 1 000 000 citizens  
have documents in  
database

# Thank you!

## *Accompanying Notes*

### **Decentralized vs. Centralized**

From a general standpoint, we are moving into a more decentralized world. This shift is possible because of new technologies and capabilities, such as linking data centers by cloud or other means. This shift is mainly due to changes in control and speed. “Decentralized” means that customers get to interact closely with the system or with people who are able to alter things in the system. The control lies in the hand of the people, closer to the actual customers, which makes the system faster.

## **X-Road**

If we look into X-Road, the backbone of eEstonia, you see that the country wants to decentralize the information technology system to do three main things:

There is no single owner or controller

Every government agency or business can choose the product that is right for them

Services can be added one at a time, as they become ready

For more information, go to <https://e-estonia.com/component/x-road/>

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<sup>1</sup> Estonia introduced the euro in January 2011.

<sup>2</sup> Poliitikauuringute Keskus Praxis <http://www.praxis.ee/vana/index.php-id=11&L=1.html>

<sup>3</sup> Poliitikauuringute Keskus Praxis <http://www.praxis.ee/vana/index.php-id=11&L=1.html>

<sup>3</sup> Estonian eHealth presentation by Artur Novek, available at [http://mug.ee/ehealth/presentations/Artur\\_Novek.pdf](http://mug.ee/ehealth/presentations/Artur_Novek.pdf)

<sup>4</sup> For more information, check the website of the National Health Insurance Fund, Estonia, <http://programs.jointlearningnetwork.org/content/estonian-health-insurance-fund>

<sup>5</sup> Text copied on August 17, 2015 <http://programs.jointlearningnetwork.org/content/estonian-health-insurance-fund>



# Healthcare Technology

An ACCESS Health International Program Area

ACCESS Health works to increase access to affordable health technologies that improve the quality of healthcare services and the functioning of health financing systems.

ACCESS Health Sweden studies eHealth technologies in Northern Europe. In this effort, we study the information infrastructure that underpins the healthcare systems. We study the design, history, context, and application of eHealth. eHealth is a term that encompasses a range of software applications in healthcare, such as patient record systems, prescription databases, and image exchanges. The ACCESS Health team has chosen to study the Estonian eHealth and eGovernance systems. Estonia has invested heavily since the early 1990s in building its eHealth infrastructure.

In Sweden, we study the Swedish eHealth system and the newly established eHealth Department, a new branch of the Swedish government. We also look at how regional healthcare systems apply national standards and implement eHealth services.

*Learn more at [www.accessh.org](http://www.accessh.org).*