The Evolution of e-Estonia

Tracing the Development of Estonia’s Government Digitization from the Soviet Era to Present, and its Transformative Effect on Estonian Society

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ABBREVIATIONS

AI - Artificial Intelligence
BA - Baltic Assembly
CCDCOE - NATO Cooperative Cyber Defence Center of Excellence
CYRENZH - Cyber Resilience Network for the Canton of Zurich
DTA - Digital Transformation with Africa
DoS - Denial of Service
EU - European Union
FDI - Foreign Direct Investment
FSU - Former Soviet Union
GDPR - The European Union’s General Data Protection Regulation
GEE - Select UN Group of Governmental Experts
ICT - Information and communication technologies
IMF - International Monetary Fund
KSI - Keyless Signature Infrastructure
NATO - North Atlantic Treaty Organization
NB8 - Nordic-Baltic Eight
NC - Nordic Council
NIIS - Nordic Institute for Interoperability Solutions
OECD - Organisation for Economic Co-operation and Development
ODIHR - Office for Democratic Institutions and Human Rights of the OSCE
OSCE - Organization for Security and Co-operation in Europe
PDPA - Personal Data Protection Act
RIA - Information System Authority
SMIT - The IT and Development Centre at the Estonian Ministry of the Interior
SSR - Soviet Socialist Republic
UN - United Nations
USSR - Union of Soviet Socialist Republics
ABSTRACT

After formally emerging from Soviet occupation in 1991 with relatively few resources and the daunting task of rebuilding a functioning government, the tiny Baltic state of Estonia quickly transformed itself into a leader in the digitization of government services. Today, Estonia is home to the world’s most advanced digital society, cleverly termed e-Estonia. This thesis represents the first comprehensive analysis of e-Estonia’s historical origin environment, legislation, implementation, and future trajectory specifically oriented towards policymakers. My aim is to provide a deep understanding of how e-Estonia has reached its present level of success, and demonstrate a practical roadmap for how the e-Estonia model may be adopted in other states utilizing lessons learned. While previous scholars have examined aspects of e-Estonia in a siloed manner - looking at specific technical components of the system or particular e-services - this approach leaves policymakers without an understanding of how the system operates as a whole and its integration into Estonian society. Similarly, I argue that the current approach to replicating the architecture of e-Estonia, which often entails exporting individual elements of the e-Estonia model in a piecemeal fashion, is incapable of achieving the same technical efficiency and facilitating the societal shift required for widespread user adoption of e-services. However, this thesis also illuminates how certain aspects of the e-Estonia model are unique to the Estonian environment in which it was created. Drawing together existing literature, interviews with scholars and members of the Estonian Riigikogu, and firsthand experience at the e-Estonia Briefing Center in Tallinn, this thesis analyzes the convergence of factors that supported the digital transformation of Estonia, including nuances in culture and geography, to provide a comprehensive understanding of how e-Estonia has shaped the relationship between government, the private sector, and the people.
CHAPTER 1: INTRODUCTION

Walking along the cobblestone streets of Tallinn, Estonia’s capital city, it is easy to forget that you are in the twenty-first century, let alone one of the world’s most digitally advanced societies\textsuperscript{1}. However, despite the medieval architecture, equipped with only a mobile device and internet connection, Estonians have access to 99% of public services digitally, including the ability to vote in national elections\textsuperscript{2}. Indeed, the extent to which Estonia has mastered the digitization of public services surpasses even the efforts of much larger, wealthier states\textsuperscript{3}. During his 2014 visit to Estonia, U.S. President Barack Obama expressed this sentiment, stating “...you’ve become a model for how citizens can interact with their government in the 21st century... I should have called the Estonians when we were setting up our health care website.”\textsuperscript{4}

Access to health records and online school reports are just a few of the many digital initiatives that together comprise Estonia’s digital ecosystem, cleverly termed “e-Estonia”\textsuperscript{5}. Before delving into the specific capabilities and achievements of e-Estonia, it is important to first establish an understanding of what the term e-Estonia actually encompasses. Different scholars have offered slightly varying interpretations and wording when describing what constitutes E-estonia, ranging from Estonia’s “policies and tangible developments regarding electronics, IT, and brand new technologies”\textsuperscript{6} to the country’s “nationwide digitization”\textsuperscript{7}, with initiatives that “include e-government services of the 1990s, cybersecurity measures in the aftermath of the

\textsuperscript{1} Elizabeth Schulze, “How a Tiny Country Bordering Russia Became One of the Most Tech-Savvy Societies in the World.”
\textsuperscript{2} “Estonia Digitised 99% of Its Public Services With the Aid of Blockchain.”
\textsuperscript{3} Paraskevopoulos, “Estonia - a European and Global Leader in the Digitalisation of Public Services.”
\textsuperscript{4} “Remarks by President Obama and President Ilves of Estonia in Joint Press Conference.”
\textsuperscript{5} “E-Health Record”; Pihlak, “Digitalisation in Service of Education Nation.”
\textsuperscript{6} Árpád Ferenc Papp-Váry, “A Successful Example of Complex Country Branding.”
\textsuperscript{7} Budnitsky, “A Relational Approach to Digital Sovereignty.”
2007 cyberattacks, and the e-Residency virtual citizenship program of the 2010s. Other scholars have avoided defining the bounds of e-Estonia altogether and instead have written around the topic - focusing on a particular program or outcome of widespread digitization. Even across sectors, from academia to the technology industry, there is no single, standardized definition of what constitutes e-Estonia because, contrary to what the term may suggest, e-Estonia is not one particular government program or piece of legislation. Rather e-Estonia may best be understood as the comprehensive web of digital public services that comprise Estonia’s “safe, convenient, and flexible digital ecosystem”. e-Estonia may often be confused for a single program because of certain foundational components of the digital ecosystem such as the state-issued digital identity and the user portal which offers a single point of access for multiple government services. For the purpose of this paper, the term e-Estonia will be used to describe Estonia's digital public service offerings and their evolution over time, as well as the preceding critical partnerships and initiatives in areas such as information technology education that laid the foundation for the current digital society.

The emergence of the term e-Estonia dates back to the year 2000, originating with a speech at the London School of Economics by former president of Estonia, and minister of foreign affairs at the time, Toomas Hendrik Ilves. While Estonia’s digital public service offerings were still in the early stages of development at the time of his speech, the choice to group the general advancements in internet usage and the integration of technology into Estonian society under the broad banner of “e-Estonia” was intended to draw a positive parallel between Estonia and the European Union’s recent eEurope initiative, according to Ilves. After Ilves’

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8 Budnitsky.
9 “E-Democracy & Open Data.”
11 Runnel, Pruulmann-Vengerfeldt, and Reinsalu, “The Estonian Tiger Leap from Post-Communism to the Information Society.”
initial introduction of the term, “e-Estonia” quickly gained traction and was shortly thereafter adopted as the title for a column sharing excerpts from the foreign press about Estonia's digital initiatives in the Ministry of Foreign Affairs publication, “Glance at the Mirror”\textsuperscript{13}. Since the early 2000s, the term e-Estonia has appeared countless times across media, industry, and academia, and has become a strategic country brand position on part of the Estonian government, as evidenced through initiatives such as the e-Estonia briefing center, which is run by the Estonian Business and Innovation Agency and serves as the primary nexus for education about Estonia’s digitization of public services\textsuperscript{14}.

Given the role that government digitization of public services has played in elevating the status of the country on numerous metrics, it is no surprise that Estonia is proud to present their progress in this arena to the world. For a country with a population of only around 1.2 million (2023), Estonia’s usage statistics related to digitization are impressive\textsuperscript{15}. Each year, over 2.5 billion transactions are processed through Estonia’s digital exchange layer, X-Road, saving an estimated 2.8 million working hours per year\textsuperscript{16}. Economically, the public use of digital signatures alone translates to a cost saving of around 2\% of Estonia’s GDP annually\textsuperscript{17}. Additionally, the process of constructing a digital society with such extensive service offerings has had positive implications for Estonia’s expertise in fields such as cybersecurity and the technology industry more broadly\textsuperscript{18}. These industries have had a substantial impact on the economic well-being of the country beyond bureaucratic cost savings - providing jobs, fostering a robust entrepreneurial environment, and attracting foreign investment and partnerships. In 2022, the technology

\textsuperscript{13} Mäe.
\textsuperscript{15} “Estonia Country Summary.”
\textsuperscript{17} Orav, “Estonia to Share Its E-Governance Know-How.”
\textsuperscript{18} Kottasová, “How Russian Threats in the 2000s Turned This Country into the Go-to Expert on Cyber Defense | CNN Business.”
industry employed nearly 5% of the workforce and generated nearly 7% of the country’s GDP\textsuperscript{19}. If a person is interested in starting an entrepreneurial venture, they can easily leverage the efficient bureaucratic environment of e-Estonia to register their new business online in just a few minutes - a sharp improvement from the former registration processing time of 5 days\textsuperscript{20}. This digital infrastructure has clearly translated to tangible impacts in entrepreneurship, with the World Economic Forum ranking Estonia first in Europe in total early-stage entrepreneurial activity\textsuperscript{21}. Under Estonia’s e-Residency program, which began in 2014 and is the first of its kind in the world, the benefits of Estonia’s business environment have been extended to people of other countries - allowing e-residents to use certain aspects of Estonia’s digital public service offerings without the need to physically reside within Estonia \textsuperscript{22}. Thus far, e-residents have established more than 21,000 companies in Estonia and the e-Residency program has helped to bring in over 32 million euros in taxes paid to the Estonian government\textsuperscript{23}. Beyond economic measures, e-Estonia also provides for the social good of Estonian society by enabling the government to more proactively meet residents’ needs\textsuperscript{24}. The e-Ambulance system, for example, allows first responders to use a patient's ID code to access time-critical information about the patient such as blood type and pregnancy status\textsuperscript{25}.

In light of these achievements, what is particularly remarkable about Estonia's comprehensive digitization is how the country has managed to do all of this while simultaneously maintaining a high degree of government transparency and accountability.

Freedom House’s annual Freedom in the World report, which takes into account citizen access to

\textsuperscript{19} Sapiton, “Emerging Europe Report.”
\textsuperscript{20} “E-Business Register.”
\textsuperscript{21} World Economic Forum, “Europe's Hidden Entrepreneurs: Entrepreneurial Employee Activity and Competitiveness in Europe.”
\textsuperscript{22} “Welcome to E-Residency.”
\textsuperscript{23} “Enter E-Estonia.”
\textsuperscript{24} Proactive EE Government Services.
\textsuperscript{25} “E-Ambulance.”
political rights and civil liberties, in 2022 ranked Estonia as “free” with a score of 94 on a scale of 1 to 100 - notably higher than the scores of neighboring countries Latvia and Lithuania, which where 88 and 89 respectively. Similarly, Transparency International listed Estonia as thirteenth best out of the one hundred and eighty countries considered based on metrics of government corruption. Earning user trust and operating in a transparent manner is of the utmost importance for a system that relies so heavily on user data to function. While other countries have experienced successes in implementation of e-government initiatives, this is one of the factors that sets e-Estonia apart on an international stage. For example, while Singapore is highly advanced in terms of their own e-government ecosystem, Singapore is notably less democratic and more centralized than Estonia.

Estonia’s progress in digitization is also remarkable because of the way that it has fundamentally changed how citizens interact with government. As expressed by a previous scholar, “The Estonian digital revolution is not only about technology but also about the creation of a citizen-friendly, service-providing state.” Along these lines, e-Estonia has not only had a tangible positive impact on the daily lives of users, but has actually helped to shape a national identity around the use of technology which transcends existing ethnic factions and politics. Understanding the identity that Estonians have forged on the forefront of digital transformation necessitates study of Estonia’s political and social history, as well as the country’s ICT development in the years leading up to the kickstarting digitization initiatives of the late 1990s. This historical context provides a greater basis for interpreting the Estonian political climate of

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26 “Countries and Territories.”
27 “Estonia.”
28 Goede, “E-Estonia.”
29 Árpád Ferenc Papp-Váry, “A Successful Example of Complex Country Branding.”
30 Annus, “A Post-Soviet Eco-Digital Nation?”
the late 1990s and the key actors that would shape policy and implementation. Therefore, the first section of this paper will focus heavily on the recent history of the country.

Additionally, taking account of the numerous factors that converged to create e-Estonia can help policymakers today to better understand how to harness certain environmental factors in their own countries to propel e-government initiatives forward. In a world that increasingly relies on digital technology, it is evident that scholars and legislators are more and more seeing the importance of digitization in facilitating government functions in an efficient and equitable manner, and as a means of managing the relationship between government and citizens. This can be seen in the United States in President Biden’s recent Digital Transformation with Africa (DTA) initiative, which specifically cites the priority of e-government service delivery, and in Switzerland through research at the University of Zurich on the potential for a citizen-lead Cyber Resilience Network for the Canton of Zurich (CYREN$^\text{ZH}$), to name just a few$^{31}$.

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$^{31}$ House, “FACT SHEET”; “CYREN ZH.”
CHAPTER 2: LITERATURE REVIEW

Previous literature on e-Estonia has predominantly focused on contextualizing the success of Estonia’s digital ecosystem with respect to a particular field of study, such as cybersecurity or economic development. However, this siloed approach does not equip policymakers outside of Estonia with a comprehensive understanding of how the entirety of the e-Estonia digital ecosystem was developed and currently functions - making it difficult to craft policies that seek to lay the groundwork for similar initiatives elsewhere.

Where current literature on e-Estonia does specifically pertain to public policy, it is often with emphasis on the larger legislative initiatives of the later 1990s. Runnel, Pruulmann-Vengerfeldt, and Reinsalu provide one of the most comprehensive examinations of Estonian ICT-related public policy in the 1990s in “The Estonian Tiger Leap From Post Communism to the Information Society: From Policy to Practice”. The primary focus of their work was assessing the advancement of digital democracy in Estonia through analysis of the level of activity of internet users in local life and how citizens are engaged in democratic processes online - finding that the number of active and versatile users was increasing compared to previous studies though more progress was needed. While their work provides foundational information on the initial public policy guiding the development of e-Estonia, given that it was published in 2009, it does not include relevant latter developments in both the digital activity of citizens and public policy more broadly. A more recent work by Budnitsky provides an orientation for policymakers in terms of government positioning on digital initiatives as it traces how Estonia’s cultural conceptions of Russia and the west have shaped digital sovereignty in the

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32 “How It All Began?”
33 Runnel, Pruulmann-Vengerfeldt, and Reinsalu, "The Estonian Tiger Leap from Post-Communism to the Information Society."
country, and draws heavily from official state documents and study of formal and informal ICT-related institutions overseen by the state. Budnitsky also provides insight into the technological legacy of Soviet Occupation in Estonia as it relates to modern e-Estonia, which is often neglected in other literature on the subject, aside from strictly historical accounts.

As previously noted, much of the existing literature on e-Estonia can be broken down into specific disciplines of study. In the research process, I have found the majority of literature to fall under one of four dominant categories: advancement of democracy, economics, cybersecurity, and technical. In the first category, discussion of digital voting often dominates. A prime example in this domain is Alvarez, Hall, and Trechsel’s analysis of the legal, technical, and cultural considerations behind Estonia’s success in implementing internet-based voting. On the economic front, existing literature has explored the economic benefits of e-Estonia from both a time-saving and bureaucratic cost-saving standpoint. Similarly, the creation of a digital environment conducive to entrepreneurial activity has been highlighted across industry, academia, and popular media. The impressive stability and continuity of operations that e-Estonia provided for the country during the covid-19 pandemic has been applauded by sources such as World Economic Forum and Forbes. Also in the economic domain, special attention has been paid to the generation of tax revenue and development of human capital through the e-Residency program.

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34 Budnitsky, “A Relational Approach to Digital Sovereignty.”
35 Velmet, “The Blank Slate E-State.”
36 Alvarez, Hall, and Trechsel, “Internet Voting in Comparative Perspective.”
37 Heller, “Estonia, the Digital Republic.”
38 “How Estonia’s Country-as-a-Service Scheme Has Attracted Tens of Thousands of Foreign Entrepreneurs | Computer Weekly.”
40 Kotka, “Estonian E-Residency: Redefining the Nation-State in the Digital Era.”
In the realm of cybersecurity, Estonia stands out as a remarkable leader in the field. Estonia's place as part of the select contingent of geographically small countries dominating in cybersecurity is discussed in depth in Melissa Griffith’s doctoral dissertation which frames the cybersecurity achievements of Estonia in the context of other states which are similarly excelling. Griffith’s work provides strong evidence for the effectiveness of Estonia’s investment in digital development and differentiates the Estonian approach to cybersecurity compared to that of other states. In her doctoral dissertation, Griffith also highlights the critical role of Estonia’s whole-of-government approach to digitization and partnerships in the private sector - factors which are at play in other aspects of Estonia’s digital ecosystem beyond just cybersecurity. Similarly, the doctoral dissertation of Alex Hardy provides insight into the everyday relationship between the state and citizens on matters of cybersecurity and how Estonia uses its reputation on the forefront of this field to extend its influence internationally.

Other literature which has approached the subject of e-Estonia from a more technical perspective provides insight into the technology underpinning the system, such as the State Issued ID cards and Estonia’s role as the first national infrastructure to integrate blockchain. In their social science analysis, Semenzin, Rozas, and Hassan use qualitative methods to expose the disparate narratives of blockchain-based governance held between stakeholders and technical experts in Estonia and the political implications of the two main camps of thought on the matter - crypto-anarchist and crypto-institutionalist. While Semenzin, Rozas, and Hassan provide critical new insight into the use of blockchain technology in the Estonian public sector, in a minor way, the article also exemplifies and adds to the confusion about e-Estonia from a policy aspect.

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41 Griffith, “The Mice That Roar.”
42 Griffith.
43 Hardy, “Securing E-Estonia.”
45 Parsov; Semenzin, Rozas, and Hassan, “Blockchain-Based Application at a Governmental Level.”
46 Semenzin, Rozas, and Hassan, “Blockchain-Based Application at a Governmental Level.”
perspective as it mistakenly described e-Estonia as a singular program\textsuperscript{47}. Scholars Sai and Boadi also approach e-Estonia through a technology-focused lens as they explain the factors influencing technological change in Estonia and how technology absorption and diffusion can be accelerated through artefactual institutions for social change\textsuperscript{48}.

Looking at how e-Estonia fits into the broader global discussion on government digitization, there is quite a bit of literature that analyzes e-Estonia alongside the digitization efforts of other states. One prime example of which is Goede’s comparison of e-government in Estonia and Singapore with an assessment of the feasibility of similar initiatives for Curacao\textsuperscript{49}. However, Goede’s work does not provide any practical roadmap for how Curacao may go about constructing e-government initiatives similar to either of the other two countries discussed and instead merely gives an overview of past ICT initiatives in Curacao\textsuperscript{50}. Ströbele, Loesk, and Trechsel provide another example of a comparative case study on e-Estonia, this time using Switzerland as the point of comparison\textsuperscript{51}. While these two case studies, among others, serve as examples of existing literature that has related the digital progress of Estonia to that of other states, there has been surprisingly little scholarship focused on specific applications for exporting the e-Estonia framework abroad that include a tangible framework for doing so. Cardash, Cilluffo, and Ottis attempt to venture into this domain by seeking to apply the model of Estonia’s Cyber Defense League to the United States, but do not provide a tangible roadmap for how this should be carried out\textsuperscript{52}.

\textsuperscript{47} Semenzin, Rozas, and Hassan.
\textsuperscript{48} Sai and Opoku Boadi, “A Bundled Approach to Explaining Technological Change.”
\textsuperscript{49} Goede, “E-Estonia.”
\textsuperscript{50} Goede.
\textsuperscript{52} Cardash, Cilluffo, and Ottis, “Estonia’s Cyber Defence League.”
CHAPTER 3: HISTORICAL FOUNDATIONS FOR E-GOVERNMENT

In the early morning of August 21, 1991 Aadu Jõgiaas and small group of other amateur radio enthusiasts were holed up in Tallinn’s Toompea Castle when they heard the radio announcement that 12 kilometers away, the invading Soviet army had entered the capital city’s tallest building, and were awaiting further instruction from Moscow⁵³. For the next 3 hours, surrounded by a ready supply of molotov cocktails and concrete barricades, Jõgiaas and his compatriots worked to jam the radio frequency, inhibiting the delivery of any more Soviet reports, until the Soviet troops gave up on their invasion and were ordered to retreat. The Soviet retreat on that day in 1991 was a momentous occasion - confirming the validity of the recently announced Estonian independence from the USSR⁵⁴.

As the story of the Toompea signal jammers demonstrates, it was not pure military strength or violence, but rather a combination of Estonian creativity and the strategic use of technology that helped to pave the way for formal independence after 51 years of Soviet and Nazi occupation⁵⁵. The events and mass movements directly leading up to the achievement of Estonian independence provide unique insight into the character of the Estonian free state that would emerge. For example, one of the most remarkable and well documented aspects of Estonia’s push towards independence was the use of song festivals as protest, earning the name “singing revolution”⁵⁶. Beginning in the mid 1980’s under Moscow’s more relaxed censorship regulations, Estonians began gatherings by the thousands and then by the hundreds of thousands to sing songs that celebrated Estonian heritage and raise the banned Estonian flag - highlighting

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⁵³ Bolton, “Tallinn’s Secret History of Espionage.”
⁵⁴ Bolton; Department Of State. The Office of Electronic Information, “Background Note: Estonia.”
⁵⁵ Taagepera, Estonia.
the general sense of pride and unity among ethnic Estonians that would persist in the years directly following 1991, and that would shape the social environment in which e-Estonia was created in the mid to late 1990s\textsuperscript{57}. Understanding how Estonia would build on this era of national unity and utilize existing resources to transform itself into one of the world’s most digitally advanced societies, requires investigating not only the events surrounding the achievement of independence, but looking even further back into the history of the country’s technological social, and political developments under Soviet occupation. This grounding in the nuances of the country’s history and the factors that had been evolving over previous decades is of the utmost importance for policymakers elsewhere as they seek to assess the environmental factors that may influence adoption of e-government in their own states.

3.1 Technical Legacy

Given the impacts of central economic planning and tight controls on research and production, the advancement of the electronics industry within the USSR as a whole often lagged considerably behind the west\textsuperscript{58}. While Estonia too suffered from these politically induced hindrances, Estonia stood out as somewhat of an exception relative to the state of the electronics industry in the rest of the USSR\textsuperscript{59}. In the 1930s, before Soviet control, Estonia was home to a sizable engineering and electronics sector, the remnants of which were revived in the 1950s under the Khrushchev “thaw”\textsuperscript{60}. As Högselius writes, “The relatively high quality of electronics achievements in the Estonian Soviet Socialist Republic (ESSR) seemed to be acknowledged, for example, by the gold medal won by Estonian radio producer Punane RET for their

\textsuperscript{57} Zunes.
\textsuperscript{58} “How Estonia Built a Digital First Government.”
\textsuperscript{59} Högselius, \textit{The Dynamics of Innovation in Eastern Europe}.
\textsuperscript{60} Högselius, 61.
radio-gramophone ‘Estonia-2’ at the Brussels world exhibition in 1958\textsuperscript{61}. In that same year, Krushchev decided that more professionals with computing skills were needed for Soviet space and defense industries, leading to the re-education of several hundred mathematicians and engineers in computing skills at the Leningrad Polytechnical Institute and Moscow Energy Institute. Among those reeducated as part of Krushchev’s initiative were a handful of Estonians who would take this computing knowledge back to Estonia and thereby provide a foundation for the discipline at home\textsuperscript{62}. Shortly thereafter, the first computer to be built in Estonia, an analogue computer designed and built by engineers at Tallinn Technical University for modeling and simulation of large power networks, was completed in 1959 (shown in figure 1)\textsuperscript{63}.

![The first analogue computer built in Estonia](image)

Figure 1: The first analogue computer built in Estonia\textsuperscript{64}

Perhaps the most influential factor in the development of Estonia’s technical capabilities under the USSR was the founding of the Institute of Cybernetics in 1960. An applied research

\textsuperscript{61} Högselius, 62.

\textsuperscript{62} “Beginning of Computing in the Soviet Baltic Region.”

\textsuperscript{63} “Beginning of Computing in the Soviet Baltic Region.”

\textsuperscript{64} “Beginning of Computing in the Soviet Baltic Region.”
unit of the Academy of Sciences of Estonia, the Institute of Cybernetics played a profound role
in shaping the technical trajectory of Estonia throughout Soviet Occupation and into the Modern
day. The primary purpose of the Institute was to address practical applications of automation
and “telemechanics” in Estonia’s growing chemical and energy industries, but the scope of
work conducted at the Institute expanded dramatically over time to include a number of
influential projects across multiple sectors. The position of the Institute of Cybernetics within
Estonia is remarkable in the context of the Soviet Union as a whole at this time, as only two
institutions in the entire Soviet Union had operations relating to cybernetics in the year 1963.
The impact of being a republic of the Soviet Union on the state of Estonian cybernetics research
is particularly important to note because the Soviet Union’s Academy of Sciences very early on
saw the value in developing and supporting this field of research. By the 1970s the Soviet
Union’s Academy of Sciences had already, for a number of years, classified cybernetics as one of
four major divisions of science and technology, which was a “treatment of cybernetics within the
hierarchy of national research and development” that was “without precedent in the world”.

The work carried out at the Institute of Cybernetics was ambitious from the start, with the
Institute quickly becoming a leading research center for the entire Baltic region. In the same
year as its founding, the first digital computer in Estonia, M-3, was built at the Institute of
Cybernetics. In the 1970s and 1980s, many of the Estonian doctoral theses written on
“decomposition and other problems of automata”, a field that would become important to fast
computers and chip design in later years, were written at the Institute of Cybernetics. In 1976,
The Institute of Cybernetics would also spawn the successful Computer Design Office, EKTA. EKTA was headed by computer engineer Harry Tani who used personal contacts with German engineers and Soviet researchers to get advanced microprocessors and printed circuits technology, thus helping EKTA to become a leader in the design and application of microprocessor systems in the Soviet Union72. In 1988, EKTA pioneered the design and manufacturing of a small personal computer called Juku for Estonian schools73. Juku was unable to be produced in bulk due to a shortage of reliable supply parts, but this early effort in the field of computer education foreshadowed the emphasis that Estonians would later place on computer education in the 1990s.

The creation and success of ETKA was just one example of the expansion of the scope of research conducted at the Institute of Cybernetics. Expansion of research domains stemmed largely from the status of the Institute of Cybernetics as an R&D subcontractor for powerful research institutions in Moscow and Leningrad74. This positioning of the Institute of Cybernetics within the Soviet research ecosystem is of particular interest because of the unusual transparency and lack of secrecy regarding the research work that was carried out at the Institute of Cybernetics compared with other Soviet technical projects. This remarkable degree of transparency resulted from the Institute carrying out the aforementioned R&D projects, while simultaneously lacking any significant contact with production enterprises, or by extension, military applications of the technology produced. The separation between the Institute’s research work and any military operations also allowed the researchers at the Institute of Cybernetics to establish relationships within international academia75. In fact, under Soviet occupation, Estonia

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72 “Beginning of Computing in the Soviet Baltic Region.”
73 “Beginning of Computing in the Soviet Baltic Region.”
74 Högselius, The Dynamics of Innovation in Eastern Europe, 64.
75 Högselius, 70.
became an important meeting place for academics, and the host site of many conferences that
brought together computer scientists from the USSR and the west due to its close proximity to
Finland with relatively easy passage via the Helsinki-Tallinn ferry. These academic
collaborations, both on the individual and institutional level, laid the groundwork for the
international partnerships that would play an important role in later initiatives such as the
introduction of the internet in Estonia, and other contributions to the development of e-Estonia
more broadly.

While the Institute of Cybernetics no longer exists in its original structure, it left a lasting
legacy in terms of technical knowledge and the development of human capital, both of which
were critical to the creation of e-Estonia. At its height in 1988, the Institute of Cybernetics had
a staff of over 600 people. After the achievement of Estonian independence, many of these
professionals were able to leverage their experiences at the Institute to find jobs at private
enterprises, thus linking the Institute of Cybernetics to the early growth of the Estonian technical
private sector. In 1997, as university structures in the country were changing, the Institute of
Cybernetics was spun off into a private company, Cybernetica, which has been instrumental in
creating many of the primary technological components of e-Estonia’s digital ecosystem, such as
X-Road.

Aside from the Institute of Cybernetics, another major factor that shaped the Estonian
technical environment of the 1990s was the influx of personal computers from the west after the
restoration of independence. Around 1991, about 20% of Americans were using personal

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76 From Russia with Code.
77 Högselius, The Dynamics of Innovation in Eastern Europe, 71.
78 “Department of Cybernetics | Tallinn University of Technology (TalTech).”
79 Högselius,116.
80 “Beginning of Computing in the Soviet Baltic Region."
81 “Our Story | Cybernetica.”
computers, but owning a personal computer was virtually unheard of at that time in Estonia."\(^{82}\)

After the restoration of independence, many western countries showed support for Estonia through the donation of computers, which Estonia eagerly embraced - leading to ambitious initiatives in computer education as will be discussed at a greater length in the Chapter Four\(^{83}\). While other Baltic states, namely Latvia and Lithuania, were also frontrunners in technical modernization as far as former Soviet Republics were concerned, they still lagged behind Estonia’s technology initiatives in considerable ways. For example, writing on the topic of internet connectivity in the Baltic region in 1997 Moffett states “But progress in each country is not equal. Estonia has made the greatest progress in restructuring its communication infrastructure and committing funds for computer hardware and software.”\(^{84}\). The positive outcome of Estonia’s efforts during the early 1990s is evident in a comparison of 1997 internet user statistics between Baltic states. In that year it was estimated that 35,000 Estonians used the internet with a similar estimate for Lithuania, while Latvia lagged slightly behind with an estimated 23,000 internet users\(^{85}\). However, in interpreting the significance of these figures, it is important to take into account each country’s total population in 1997. Estonia had a population of 1,399,535, which was less than half of Latvia's 2,432,851 and slightly over one third of Lithuania's 3,575,137, therefore demonstrating Estonia's significant edge over other Baltic states in proportion of internet users\(^{86}\).

### 3.2 Social Legacy

\(^{82}\) “How Estonia Built a Digital First Government.”

\(^{83}\) Árpád Ferenc Papp-Váry, “A Successful Example of Complex Country Branding.”

\(^{84}\) Moffett, “Baltic States.”

\(^{85}\) Moffett.

\(^{86}\) “Population, Total - Latvia | Data”; “Population, Total - Estonia | Data”; “Population, Total - Lithuania | Data.”
The technical expertise that evolved under the Soviets was not the only legacy of this period in Estonia’s history that would shape the development of e-Estonia. The experiences of Estonians under Soviet occupation and the events surrounding the restoration of independence had a lasting impact on the social trajectory of the country in the 1990s - creating an environment of heightened national pride and trust in the newly established independent government structures. This environment of popular support for the Estonian government would play a role in the country’s aptitude for e-government later in the decade.

In order to understand the widespread confidence in official institutions that characterized the 1990s in Estonia, one needs to understand the disparate sentiment of fear and distrust that was prevalent among Estonians during the period of Soviet occupation. As documented by Estonia’s Museum of Occupations, intrusion into the privacy of Estonians as they went about their everyday lives took many forms. Even before the official Soviet invasion of Estonia in 1940, Soviet security forces were collecting large amounts of data on individual Estonian citizens, which would result in the deportation of 10,000 Estonians to Siberia in 1941 and up to another 60,000 in 1949. Given the harrowing experiences of Estonians under Soviet occupation, it may seem surprising that a people who had come to fear government surveillance would later support digitization initiatives that would appear to give the central government more room for violation of privacy. However, the shifting demographics and cultural allegiances towards the end of occupation may explain this unique and seemingly contradictory scenario.

The Soviet practice of industrializing annexed states was largely responsible for the influx of ethnic Russians to Estonia as laborers during Soviet occupation. By the mid 1980s, the Russian population in Estonia had climbed to 30.3% with ethnic Estonias making up only 61%.

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87 Bolton, “Tallinn’s Secret History of Espionage.”
88 World, “The Victims of Soviet Deportations Remembered in Estonia.”
89 Kukk, “Political Opposition in Soviet Estonia 1940-1987.”
of the total population. As noted by Gerner, these demographic shifts would “come to have a strong influence on policy in independent Estonia.” In fact, one of the primary rallying points for Estonians seeking independence in the 1980s was the growing fear that they would soon be outnumbered on their own soil, which provided the pressure to act swiftly to secure independence. The means used to secure independence, including holding assemblies to sing traditional Estonian songs, also helped to further engrain a sense of cohesion among Estonians.

![Figure 2: Estonians at the Tallinn Song Festival Grounds on 11 September 1988.](image)

When Estonian independence eventually prevailed, these cultural sentiments translated into a heightened sense of regard for the newly established Estonian government and the younger generation of politicians that were distinctly homegrown and ethnically Estonian. The distinction between Soviet government structures that were treated with distrust, and the new

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90 Gerner, The Baltic States and the End of the Soviet Empire, 73.
91 Gerner, 73.
92 Joseph M.Ellis, Keeley Wood, “REVOLUTION BY SONG: CHORAL SINGING AND POLITICAL CHANGE IN ESTONIA.”
93 Tambur, “30 Years since the Most Important Singing Revolution Concert.”
94 Park, “Ethnicity and Independence.”
Estonian government that inspired hope, meant that Estonian citizens now viewed government as a whole in a fundamentally different light\textsuperscript{95}. Therefore, the lack of public concern about potential government violations of privacy with the new Estonian government was the precursor to citizen support for projects that would constitute the early-stage development of e-Estonia.

3.3 Political Legacy

As previously established, at the fall of the Soviet Union, there was a high degree of political optimism among Estonians as a new generation of leaders shaped Estonia’s public sector. However, the seeds of Estonia's post-independence government had been cultivated for many years both directly and indirectly through strategic political maneuvers under the Soviets. Going all the way back to the mid 1940s, the first secretary of the Estonian Communist Party (ECP) along with other members of the Party, while still answering to leadership in Moscow, worked to lessen the harshness of collectivization policies on the Estonian people\textsuperscript{96}. These efforts under early Party leadership and the maintenance of Estonian language in schools allowed Estonians to hold on to a sense of national identity throughout occupation\textsuperscript{97}. Therefore, even from the early years of occupation, Estonia experienced a certain degree of political and economic autonomy within the greater Soviet environment\textsuperscript{98}. Notably, the trajectory of increasing autonomy in the political realm is perhaps most obvious in the 1987 \textit{Ise Majandav Eesti} (IME) project. Drafted by four Estonian Mid-level Communist Party men, it entailed drastic changes to the Estonian economic sphere, including bringing economic institutions on Estonian territory under Estonian control and establishing a separate local budget\textsuperscript{99}. While IME

\textsuperscript{95} Pihlak, “What's behind Estonia’s Digital Success?”
\textsuperscript{96} Johnston and Aarelaid-Tart, “Generations, Microcohorts, and Long-Term Mobilization.”, 679.
\textsuperscript{97} Kukk, “Political Opposition in Soviet Estonia 1940-1987.”
\textsuperscript{98} Johnston and Aarelaid-Tart, 679.
\textsuperscript{99} Gerner, \textit{The Baltic States and the End of the Soviet Empire}, 78.
was never implemented due to already changing economic conditions that no longer necessitated the plan, IME represented an important political statement and a step toward the eventual reclamation of independence from the USSR\textsuperscript{100}. More significantly, the strong public sentiments that arose around IME led to the formation of the Estonian popular front the following year, which advocated for Perestroika and was the first political structure outside of the tightly controlled Communist Party to be permitted\textsuperscript{101}. In 1990, elections were held for “the ‘Congress of Estonia’, a newly formed governing body meant to challenge the legitimacy of the Estonian Supreme Soviet”\textsuperscript{102}. Meanwhile the Estonian Supreme Soviet held their first democratic, multiparty elections in March of that year\textsuperscript{103} - signaling that the tide of a new era was rising even within the established system. Further actions that laid the groundwork for an independent Estonia on a political, economic, and technical level included steps such as separating telecommunication functions from the rest of the USSR\textsuperscript{104}.

While certain elements of the foundation had been laid for an independent Estonian government, after 1991, Estonia was in the position to make choices that would have a profound impact on the development of e-government later in the decade. Despite the legal assertion that the 1991 independence of Estonia from the USSR represented a restoration of the 1918 Estonian Republic, a concept which scholars have termed the “restoration doctrine”\textsuperscript{105}, there was still the issue of practical implementation. As Griffith articulates, “Estonia came of age in the cyber era”\textsuperscript{106}, which meant that the country was crafting many of its new policies amid the growing

\textsuperscript{100} Gerner, 79.
\textsuperscript{101} Gerner, 80.
\textsuperscript{102} A. Lorraine Kaljund, “Restoration Doctrine Rebooted: Codifying Continuity in the Estonian Data Embassy Initiative.”
\textsuperscript{103} A. Lorraine Kaljund.
\textsuperscript{104} “Beginning of Computing in the Soviet Baltic Region.”, 81.
\textsuperscript{105} A. Lorraine Kaljund, “Restoration Doctrine Rebooted: Codifying Continuity in the Estonian Data Embassy Initiative.”
\textsuperscript{106} Griffith, “The Mice That Roar.”, 107.
importance of the internet and digitization. Instead of having to modify existing, outdated systems, Estonia was able to jump directly into building a technical state even with limited resources, using lessons learned from the mistakes and successes of other countries. As former Prime Minister Mart Laar recalls, he was advised by a professor of computer engineering at Tallinn University of Technology, “don’t buy anything old”, to prevent the legacy trap transpiring in western countries\textsuperscript{107}. Estonia was also able to emerge as a leader in the field of cybersecurity at a national level in part because the country was developing its overall defense postures in light of both physical and cyber threats\textsuperscript{108}.

The state of the Estonian economy at the time also had a significant impact on the early development of government digitization initiatives, since the nearly bankrupt government had to embrace distributed IT systems and private partnerships to get around the high costs of a centralized system\textsuperscript{109}. This would evolve into Estonia’s current network of decentralized and interoperable databases connected through the exchange layer X-Road\textsuperscript{110}.

Returning to the story of Aadu Jõgiaas and the signal jamming efforts discussed in the opening of this chapter, the site of this remarkable story, Toompea Castle, is no longer surrounded by concrete barricades and homemade weaponry. Instead, Toompea Castle once again serves as the seat of the Estonian Parliament, the Riigikogu, where the legislative foundation was laid for the numerous digitization initiatives that would come to constitute e-Estonia as discussed in the following chapter\textsuperscript{111}.

\textsuperscript{107} Pihlak, “What’s behind Estonia’s Digital Success?”.
\textsuperscript{108} Griffith, “The Mice That Roar.”
\textsuperscript{109} Pihlak, “What’s behind Estonia’s Digital Success?”
\textsuperscript{110} “Facts & Figures.”
\textsuperscript{111} plats 1a et al., “Supreme Soviet of the ESSR/ Supreme Council of the Republic of Estonia.”
CHAPTER 4: POLICY & POLITICS

When asked in an interview why more countries have yet to follow Estonia’s example of government digitization, former president of Estonia, Toomas Hendrik Ilves, responded “I keep stressing it’s not the technology. It’s political will, policy, laws and regulations, in that order. In order for it to work, you need laws that underpin the system. You want to define digital identity, then set out the regulations to avoid abuses…”112. In keeping with this sentiment expressed by Ilves, understanding the institutional framework in which e-Estonia was crafted and implemented, and the legislation that initiated and continues to guide such digitization efforts is of the utmost importance for policymakers. While much of the existing academic analysis of legislation relating to e-Estonia tends to focus solely or at least predominantly on the legislation of the 1990s, this chapter will provide both a comprehensive overview of legislation and relevant government institutions from that time period as well as the more recent developments. This chapter covers what I have found in my research to be the four most pertinent categories: 1) Foundational institutions 2). Guiding legislation that provides the general framework within which more specific e-government initiatives can be enacted, 3). Legislation pertaining to user adoption and education initiatives, and 4). Legislation that codifies user rights, privacy, and security with respect to e-government. These four categories provide the general context necessary to understanding e-Estonia's more specific legislative developments. Additionally, the organization of this chapter into the four aforementioned sections is intended to address some of the most common questions that policymakers may have when starting down the path of

112 “Estonia’s Remarkable Digital Transformation - In the Trenches - IMF F&D Magazine."
digitization, such as how to ensure user adoption and how to ensure the rights of users are protected.

Something to keep in mind while reading this chapter, is that, as explained by scholars Kattel and Mergel, policy in Estonia has largely followed the principle of the hiding hand, a term coined by political economist Albert Hirschman\(^\text{113}\). According to the principle of the hiding hand, policy-makers take on initiatives without realizing the extent of the challenges and risks involved, and this can result in unexpected learning and creativity\(^\text{114}\). Therefore, though the policy and institutions discussed in this chapter have been fundamental to the success of e-Estonia, one should not harbor the illusion that Estonian legislators have been working, or are currently working, within a perfectly pre-defined plan of action. Within Estonia’s dynamic policy environment, Kattel and Mergel also note the critical role of small, tight networks of dedicated politicians, business leaders, and civil servants with visionary ideas in the development of e-Estonia. Mart Larr, the first prime minister after Estonia’s re-independence and again from 1999-2002, echoes this sentiment in saying “I was 32, I was young and crazy, so I didn’t know what is possible and what’s not, so I did impossible things”\(^\text{115}\). As exemplified by Laar, the generation of politicians that arose after Estonia’s restoration of independence, were not only optimistic in the course they were charting for the country, but were developing their agenda and policy positions in the midst of the technology boom of the 1990s\(^\text{116}\). This environmental factor translated to widespread cross-party support for government digitization, which meant that initiatives could be acted upon quickly, uninhibited by political bargaining.

\(^{114}\) Rainer Kattel, Ines Mergel.
\(^{115}\) Rainer Kattel, Ines Mergel.
\(^{116}\) Griffith, “The Mice That Roar.”
4.1 Foundational Institutions

Before delving into an analysis of the early legislation relating to e-Estonia, it is important to have at least a rudimentary understanding of Estonia’s government structure and its parliament, the Riigikogu. Directly prior to independence, in the year 1990, the last Supreme Council of the ESSR was selected via democratic election for the first time in its history\(^{117}\), and in May of that year, the name of this governing body was changed to the Supreme Council of the Republic of Estonia. It was the Supreme Council of the Republic of Estonia which passed the Resolution on the national independence of Estonia, adopted on 20 August 1991\(^{118}\). The transition from the Supreme Council of Estonia to the Riigikogu as Estonia’s legislative body, took place in 1992 based on provisions of the 1992 Estonian constitution and marked an official transition away from Soviet governance structures\(^{119}\). The constitution of June 28, 1992, which was drafted by the constitutional assembly and passed by referendum, drew heavily from the Estonian constitution of 1938 in adherence to the “restoration doctrine”\(^{120}\) – asserting the legal continuity of the Republic of Estonia prior to the Soviet occupation\(^{121}\). The 1992 constitution established the Riigikogu as the unicameral parliamentary body made up of 101 representatives elected according to proportional representation every 4 years\(^{122}\). Additionally, the 1992 constitution established the president as the chief of state to be indirectly elected by the Riigikogu, and the Prime minister as the head of government chosen by the president\(^{123}\).

During the 7th session of the Riigikogu, the first session since the independence of 1992, many foundational government structures were put in place that would later accommodate the

\(^{117}\) plats 1a et al., “Supreme Soviet of the ESSR/ Supreme Council of the Republic of Estonia.”

\(^{118}\) plats 1a et al.

\(^{119}\) plats 1a et al., “7th Riigikogu.”

\(^{120}\) A. Lorraine Kaljund, “Restoration Doctrine Rebooted: Codifying Continuity in the Estonian Data Embassy Initiative.”

\(^{121}\) “Background Notes: Estonia 09/97.”

\(^{122}\) “Background Notes: Estonia 09/97.”

\(^{123}\) Department Of State. The Office of Electronic Information, “Estonia (05/08).”
growth of e-government. One of the most important of those government structures was the Department of State Information Systems, which was established under the Government Office - an institution that supports the Estonian government and the Prime minister in planning and implementing policy. The Department of State Information Systems, presently renamed the Government Chief Information Officer (CIO) Office, serves as the organization responsible for coordinating the government's overall ICT and Information society policy and provides the stamp of approval for each Agency's and each Ministry's IT development plans. Another government institution integral to the development of e-Estonia that was formed during this period was the Estonian Informatics fund, founded in 1990 and then reorganized in 1996 into the Estonian Informatics Centre. This institution continues to be responsible for the technological platforms and cybersecurity associated with the digital state, and now operates under the name the Estonian Information System Authority (RIA). Another critical development for the management of Estonian digitization efforts occurred in 2008 with the creation of the IT and Development Centre at the Estonian Ministry of the Interior (SMIT). SMIT is responsible for the service provision for ICT solutions within the domain of the Ministry of the Interior such as security systems of the Police and Border Guard Board and the Population Register. Looking slightly further back in history, one of e-Estonia’s most important institutions, known at the time as the Estonian Informatics Council, was actually created under the Soviets in 1989. While this council has had different names and focuses through the decades, today it is known as the

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124 plats 1a et al., “7th Riigikogu.”
125 “About Government Office | Riigikantelei.”
126 Eaves, Pope, and McGuire, “Government as a Platform.”
127 Eaves, Pope, and McGuire.
128 “E-Estonia, the Information Society since 1997.”
129 “Tasks and Structure of the Authority | RIA.”
130 Paraskevopoulos, “Who in Estonia Decides How to Digitalise the Country?”
131 Paraskevopoulos.
132 Paraskevopoulos.
e-Estonia Council and decides the overall direction and development of Estonia’s digital society.\textsuperscript{133}

In analyzing the institutional framework that supports e-Estonia, it is critical to know that there has never been one singular, central office for digitization, unlike in other countries such as the UK's Government Digital Service (GDS).\textsuperscript{134} Instead, the diffusion of responsibilities across multiple government institutions has allowed for unique flexibility in the Estonian model.\textsuperscript{135} The creation of the early institutional framework previously discussed helped to ensure an organized yet decentralized development of IT initiatives across government that maintained a sense of continuity.\textsuperscript{136}

4.2 Guiding Legislation

On the legislative front, ideas found in early Estonian policy on the subject of e-government can be traced back to the 1994 paper “The Estonian Way to the Information Society”\textsuperscript{137}, which was one of the first strategy papers in Estonia on the development of state information systems. Developed by a group of IT specialists, government officials, and academics, this paper helped lead to the creation of the 1998 Principles of Estonian Information Policy.\textsuperscript{138} While initiatives relating to digitization had been passed by the Riigikogu earlier in the 1990s, the Principles of Estonian Information Policy developed by the Ministry of Economic Affairs and Communications\textsuperscript{139} was perhaps the most foundational piece of legislation to be passed in this time period and in the long-term trajectory of e-Estonia. Passed by the 8th Riigikogu,\textsuperscript{140} the purpose of this document was to “serve as a basis for an action plan for

\textsuperscript{133} Paraskevopoulos.
\textsuperscript{134} Rainer Kattel, Ines Mergel, “Estonia's Digital Transformation: Mission Mystique and the Hiding Hand.”
\textsuperscript{135} Rainer Kattel, Ines Mergel.
\textsuperscript{136} “E-Estonia, the Information Society since 1997.”
\textsuperscript{137} “E-Estonia, the Information Society since 1997.”
\textsuperscript{138} “E-Estonia, the Information Society since 1997.”
\textsuperscript{139} “E-Estonia, the Information Society since 1997.”
\textsuperscript{140} plats 1a et al., “8th Riigikogu.”
establishing an information society.”¹⁴¹ Drawing also from similar policies being developed at the time throughout the EU¹⁴², this document clearly outlined the ambitious vision of the Estonian government that would provide the direction for all policy relating to the information society moving forward¹⁴³. The 1998 Principles of Estonian Information Policy helped to define the role that the government should play in creating an information society and highlighted four key topics of focus. These 4 topics were: modernization of legislation, supporting the development of the private sector, shaping the interaction between the state and citizens, and raising awareness of problems concerning the information society¹⁴⁴. Notable here is the explicit emphasis within the document not only on technology development, but on the social factors that affect its usage. Along these lines, the Principles of Estonian Information Policy is unique in its explicit purpose as a coalescing of the “shared societal values that serve as a basis for making public policy decisions to support the rise of the information society”¹⁴⁵. While the 1998 Principles of Estonian Information Policy did not contain any measurable benchmarks for the achievement of the information society objectives¹⁴⁶, on a practical front, this document led to an Information Policy Action Plan where “all Government agencies made specific proposals with schedules, sources of finance, and responsibilities for implementation of information policy” updated on an annual basis¹⁴⁷. In 2004, a next generation version of the Principles of Estonian Information Policy for 2004-2006 was approved by the legislature with a deepened emphasis on development of e-government services building off of existing work¹⁴⁸. Another one of the most notable legislative developments in this era related to e-government was the passage of the

¹⁴¹ “Principles of Estonian Information Policy.”
¹⁴² “E-Estonia, the Information Society since 1997.”
¹⁴³ Kalvet, “The Estonian Information Society Developments Since The1990s.”
¹⁴⁴ “Principles of Estonian Information Policy.”
¹⁴⁵ “Principles of Estonian Information Policy.”
¹⁴⁶ “E-Estonia, the Information Society since 1997.”
¹⁴⁷ Kalvet, “The Estonian Information Society Developments Since The1990s.”
¹⁴⁸ Kalvet.
Telecommunications Act by the Riigikogu in 2000, which established that Internet connection must be universally available to all subscribers at a uniform price regardless of geographic location\textsuperscript{149}. This critical piece of legislation helped to create an environment where e-government could flourish in an equitable manner, which should be noted by policymakers elsewhere.

In the present day, the digital development of Estonia is guided by the Estonian Digital Society Development Plan, also known as the Digital Agenda 2030, approved by the Riigikogu in 2021\textsuperscript{150}. This plan emphasizes three primary pillars: digital state development, national cyber security, and transmission connections\textsuperscript{151}. Specific next steps outlined in the plan include the proactive government provision of digital services based on a life events model, whereby users are presented with the relevant services at each major life milestone such as the birth of a child, and the use of AI powered chatbots for all digital procedures in the public sector\textsuperscript{152}.

Circling back to the ideas expressed in chapter one of this thesis regarding the relevance of Estonian culture and its place in the political rhetoric of post Soviet Estonia, it is interesting to note that the preservation of Estonian language and culture is listed as one of the seven principles of the Estonian Digital Society Development Plan\textsuperscript{153}. Within the Estonian Digital Society Development Plan are provisions for implementation of the plan via a digital society program. The digital society program is “prepared for four years and updated along with the budget strategy once a year” and includes “specific measures, metrics, responsible agents and a budget, etc” guided by a steering group and advisory committees for specific fields\textsuperscript{154}. The cost of the initiatives outlined in the plan have been estimated to be approximately 1.2 billion euros over the

\textsuperscript{149} Pollicino, “The Right to Internet Access.”
\textsuperscript{150} plats 1a et al., “The Riigikogu Received an Overview of the Digital Society Development Plan.”
\textsuperscript{151} “The Government Approved the Vision for the Estonian Digital Society for the next Decade | Eesti Vabariigi Valitsus.”
\textsuperscript{152} “Estonia’s Digital Agenda 2030.”, 14.
\textsuperscript{153} “Estonia’s Digital Agenda 2030.”
\textsuperscript{154} “Estonia’s Digital Agenda 2030.”, 5.
next ten years\textsuperscript{155}, with a significant portion of this funding expected to come from the European Union in addition to domestic sources\textsuperscript{156}.

Another recent policy development in e-Estonia’s overall trajectory is Estonia’s National Artificial Intelligence Strategy 2019-2021\textsuperscript{157}. The strategy document is based on proposals to advance the use of AI in Estonia that were presented by a group of experts led by the Ministry of Economic Affairs and Communications and the Government Office\textsuperscript{158}. The strategy document outlines “actions the Estonian government will take to advance the take up of AI in both private and public sector, to increase the relevant skills and research and development (R&D) base, as well as to develop the legal environment.”\textsuperscript{159}. The structure of the document follows a layout of proposed objectives with a specific action item for each proposal, designation of the responsible agency, deadline for achievement, and a budget allocation\textsuperscript{160}. The specificity of this strategy document shows an evolution from Estonia’s early digitization strategies, which expressed visionary ideas with less emphasis on implementation, as previously discussed. Estonia’s new national artificial intelligence strategy for 2022-2023 aims to continue building and expanding on previous objectives\textsuperscript{161}. Within Estonia’s National Artificial Intelligence Strategy 2019-2021 it is explicitly stated that The National Artificial Intelligence Strategy 2019-2021 is synchronized with EU activities and serves as the Estonian National AI strategy in the context of the EU’s coordinated AI action plan. As will be discussed in the following chapter, EU membership and the journey to achieving it have had notable impacts on the development trajectory of Estonian digitization policy more broadly.

\textsuperscript{155} plats 1a et al., “The Riigikogu Received an Overview of the Digital Society Development Plan.”

\textsuperscript{156} “The Government Approved the Vision for the Estonian Digital Society for the next Decade | Eesti Vabariigi Valitsus.”

\textsuperscript{157} “Estonia’s Digital Agenda 2030.”

\textsuperscript{158} “Estonia’s National Artificial Intelligence Strategy 2019-2021.”

\textsuperscript{159} “Estonia’s National Artificial Intelligence Strategy 2019-2021.”

\textsuperscript{160} “Estonia’s National Artificial Intelligence Strategy 2019-2021.”

\textsuperscript{161} Paraskevopoulos, “Data as an Enabler.”
The impact of Estonia’s National Artificial Intelligence Strategy on the nation-wide adoption of AI is already visible through the increase in projects using AI in the country, which grew from 4 public sector projects in 2019 to 80 projects across the public and private sectors as of 2022. One of the most comprehensive projects recently undertaken in the public sector has been the development of the Bürokratt - an AI based virtual assistant which uses voice-based personal interactions to empower citizens to communicate with the government and utilize services even if they are unsure of which agency to contact. The name of this initiative itself deserves mention as a testament to the clever ways in which the Estonian government has deliberately nested its e-government initiatives within the cultural fabric of the country. In Estonian folklore, a Kratt is a mythological creature made of hay and miscellaneous household objects that comes to life to perform menial labor for its owner. Introducing the new, and possibly unfamiliar, AI technology to the public via this familiar cultural reference point illustrates the forethought of the Estonian government in designing initiatives to optimize user adoption.

4.3 Education and User Adoption Initiatives

Aside from institutional structures and strategy-related legislation, another area in which the Estonian government set itself up for success in the early years of digitization was through initiatives that empowered Estonians to build the skills necessary to utilize digital services. Along these lines, one of the most foundational projects undertaken in the 1990s, and one of the most frequently referenced in existing literature, is Tiigrihüppe, known in English as the Tiger.

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162 Paraskevopoulos, “Who in Estonia Decides How to Digitalise the Country?”
163 “Hits, Misses, and Lessons Learned.”
164 Adhele, “New E-Estonia Factsheet.”
Leap program. Announced in 1996 and officially launched in 1997\(^{165}\), Tiger Leap aimed at modernizing the Estonian education system through technology. The three primary components of the program were bringing internet access and computers to schools, providing teacher training in ICT, and the development of educational courseware\(^{166}\). In 1997, the Tiger Leap Foundation was created to spearhead the implementation of these priorities\(^{167}\). Utilizing a foundation-based structure of administration allowed for robust public-private partnerships to emerge without the limitations of a more formal bureaucracy\(^{168}\). Funding for the Tiger Leap program was first allocated in the Estonian national budget of 1997\(^{169}\). Under part 30 of the budget document detailing expenses for the Ministry of Education, section 08 allocates 35,500,000 Estonian Kroons towards the “computerization of the education system” out of a total Ministry of Education budget of 2,263,931,000 Kroons\(^{170}\). It is critical to note that this budget allocation for Tiger Leap was comparable to the whole national IT budget of Estonia at this time\(^{171}\). To put these numbers into perspective for western readers, Estonia’s total state budget of 12,512,034,000 Kroons in 1997, translated to roughly USD 1 billion at the time\(^{172}\). Throughout its duration, the program received the equivalent of about USD 10 million in state funding\(^{173}\). Though the state budget was the largest source of funding, funding for the Tiger Leap program came from a combination of sources, with just over a third of total contributions between 1997 and 2002 originating from municipalities, and to a lesser extent, from private

\(^{165}\) Runnel, Pruulmann-Vengerfeldt, and Reinsalu, “The Estonian Tiger Leap from Post-Communism to the Information Society.”

\(^{166}\) “How It All Began?”

\(^{167}\) Aru-Chabilan, “Tiger Leap for Digital Turn in the Estonian Education.”


\(^{171}\) Aru-Chabilan, “Tiger Leap for Digital Turn in the Estonian Education.”

\(^{172}\) “Background Notes: Estonia 09/97.”

\(^{173}\) OECD, “2. Case Study: The Estonian Education Information System (EHIS).”
sponsors. Tiger Leap also received roughly USD 2 million from the European Union. The primary government figures behind the creation and launch of the Tiger Leap Program were Toomas Hendrik Ilves, who was the Estonian ambassador to the US at the time, Jaak Aaviksoo who was the minister of education at the time, and then President Lennart Georg Meri.

At the conclusion of the Tiger Leap program in 2000, a final report outlined much of the tangible progress in ICT development in Estonian schools that had been made under the program, including installing computers in all 560 primary and secondary schools, providing internet access to 75% of primary and secondary schools, and 65% of all primary and secondary school teachers passing a 40-hour computer literacy course, among other things. In that same year, the Tiger Leap Foundation organized the first national survey on ICT in Estonian schools in partnership with the Department of Government and the Centre of Educational Technology in Tallinn Pedagogical University, Estonia’s largest teacher training institution. The survey of 98 of Estonia’s 560 primary and secondary schools found that significant progress still needed to be made in the way of infrastructure, student competencies, and uniform access to ICT - highlighting that the Tiger Leap program was not a panacea in the realm of digital literacy, but rather a strong starting point. One key finding of the study that stands out as indicative of Estonia’s ability to continue on the trajectory of digitization is that the majority of students held strong, positive attitudes towards the role of ICT in learning and in society more broadly.

Building on this point, the positive attention that the Tiger Leap program received in the media both nationally and internationally not only helped to cultivate positive feelings towards the

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174 Aru-Chabilan, "Tiger Leap for Digital Turn in the Estonian Education."
175 OECD, “2. Case Study: The Estonian Education Information System (EHIS).”
176 “E-Estonia, the Information Society since 1997.”
177 Toots and Laanpere, "Tiger in Focus – a National Survey of ICT in Estonian Schools."
178 Toots and Laanpere.
179 Toots and Laanpere.
program\textsuperscript{180}, but aided in the early-stage development of a technology-oriented identity in many Estonians\textsuperscript{181}.

As a result of the Tiger Leap program, by 2001, all schools in Estonia were equipped with computers and internet connection\textsuperscript{182}. After the conclusion of the Tiger Leap program, a follow-on program, Tiger Leap Plus was enacted for the years 2001-2005\textsuperscript{183}. From 2006-2009 the Learning Tiger development plan from the Ministry of Education and Research focused primarily on promoting e-learning as part of school curriculum\textsuperscript{184}. A plethora of additional programs in digital literacy have been supported through the Tiger Leap foundation since the early 2000s including DigiTiger, which aimed to educate teachers on using IT in learning, and TechnoTiger, which provided support to teachers with the aim of increasing the number of students electing to continue education in technology, among others\textsuperscript{185}. More recent initiatives on the part of the Estonian government have included ProgeTiger, launched in 2012 as a joint initiative of the Estonian Ministry of Education and Research and the former Estonian Information Technology Foundation for Education\textsuperscript{186}. ProgeTiger aims to develop technological literacy in engineering sciences, information technology, and design & technology starting in students as young as Kindergarten all the way through high school and vocational school\textsuperscript{187}. Since 2011, the national educational curriculum of Estonia itself also promotes the widespread use of technology in education through a cross-curricular theme called “Technology and

\textsuperscript{180} Toots and Laanpera.
\textsuperscript{181} Árpád Ferenc Papp-Váry, “A Successful Example of Complex Country Branding.”
\textsuperscript{182} OECD, “2. Case Study: The Estonian Education Information System (EHIS).”
\textsuperscript{183} Toots and Laanpera, “Tiger in Focus – a National Survey of ICT in Estonian Schools.”
\textsuperscript{184} Märia, “National Report of Estonia.”
\textsuperscript{185} OECD, “2. Case Study: The Estonian Education Information System (EHIS).”
\textsuperscript{186} Toome, “ProgeTiger.”
\textsuperscript{187} Toome.
Innovation”, which requires teachers to integrate technology into their teaching regardless of subject area\textsuperscript{188}.

More general policy and legislation promoting digital literacy among Estonia’s youth is embedded in documents such as the 2010 Basic and Secondary Schools Act, which requires all publishers of educational literature compliant with national curricula to make their content “also available digitally in a portal run by the Education and Youth Authority”\textsuperscript{189}. This aligns with Estonia’s forward-thinking development of electronic education materials in the early 2000s, which were available at the time through the educational portal SchoolLife, established in 2001\textsuperscript{190}. Today, the majority of schools in Estonia use the online platform e-Kool, or “e-School” as it is translated in English, which was developed through a public-private partnership in 2002 and allows teachers to carry out basic administrative functions such as posting grades and collecting student assignments, and allows for communication between teachers, students’ families, and government supervisory bodies\textsuperscript{191}.

As an aside, this existing digital infrastructure and user competency among teachers and students gave Estonia an advantage in the shift to distance learning that occurred during the Covid-19 pandemic. While other countries were scrambling to establish online learning norms, Estonia was able to rely on existing resources such as e-Koolikott, or “e-schoolbag”, a nationwide online library of more than 20,000 educational resources developed in 2016 by the Ministry of Education and Research\textsuperscript{192}. e-Koolikott, is run jointly by two-government supported foundations, the Information Technology Foundation for Education (HITSA), founded in 2013 to encourage digital skills development in education, and The Education and Youth Board,

\textsuperscript{188} Toome; “National Curriculum for Basic Schools–Riigi Teataja.”
\textsuperscript{189} “Basic Schools and Upper Secondary Schools Act.”
\textsuperscript{190} “Basic Schools and Upper Secondary Schools Act.”
\textsuperscript{191} “A Step Ahead.”
\textsuperscript{192} “A Step Ahead.”
formerly known as the Innove Foundation, which was founded in 2003 to provide implementation support for the Ministry of Education and Research. These two institutions have also been instrumental in overseeing a number of other initiatives related to digital education across Estonia. Overall, the Estonian government's success in promoting digital skills can be seen in the fact that students in Estonia pursue IT careers at twice the average rate seen in other OECD countries.

While the Estonian government has paid notable attention to the development of digital skills within the youth population, Estonia has by no means neglected the development of digital competencies within other age demographics. With the advent of the first e-government offerings in the late 1990s and early 2000s, Estonia was quick to set up programs to promote the development of digital literacy in adults by utilizing strong partnerships with the private sector. One of the most impactful initiatives in this realm was the Look@World project, which aimed to "increase the quality of life of Estonia’s residents, as well as the country’s competitiveness in Europe, by supporting a rapid increase in the use of the Internet." The project, which took place over the course of two years, was facilitated through the Look@World Foundation established in 2001 by a consortium of ten large companies led by Estonian-founded bank, Hansapank. As stated by Hansapank’s Alar Ehandi, head of the Look@World project at the time of its founding, the “Look@World Foundation, which is being set up by the companies that are behind this project, will become an umbrella organization to bring together companies which

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193 “A Step Ahead”; “Avaleht | Haridus- Ja Noorteamet.”
194 “Digital Skills.”
195 Alar Ehandi, “The ‘Look@World’ Project: An Initiative from Estonia’s Private Sector to Boost Internet Use.”
are willing to contribute toward the development of the E-society by making investments and by engaging in very close cooperation with the state.”

Over the span of the two-year Look@World project, 40 million Estonian kroons (2.5 million euros at the time) donated by private sector members of the Look@World Foundation were dedicated to providing free computer training to approximately 100,000 elderly people, which constituted roughly 10% of the Estonian population at the time. This was a significant inroad in digital education among the adult population, given the widespread lack of public access to computers under the Soviets, as previously discussed. Funds from the Foundation’s 40 million Kroon pool were also allocated towards the creation of the e-School and e-Library platforms, and the opening of around 500 public internet access locations. As one of Estonia’s largest public-private partnerships, the Look@World Foundation has been instrumental in a number of other projects for the development of e-Estonia both in terms of general user education and in the actual roll-out of technology. For example, The Look@World Foundation in cooperation with additional private sector companies launched the Ole Kaas!, or “Come Along!” project which aimed to provide computer training to 100,000 adults and internet connection to 50,000 families between 2009-2011, specifically targeting traditionally underserved populations such as those in rural and low-income areas. On the technological front, in the early to mid 2000s, the Look@World Foundation worked directly with the Estonian Government in the roll out of the ID-Card, which is a state-issued mandatory identification card with a built-in chip that carries embedded files to serve as a secure digital authentication of

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197 Alar Ehandi, “The ‘Look@World’ Project: An Initiative from Estonia’s Private Sector to Boost Internet Use.”
199 Määr.
identity and provides digital access to the entirety of Estonia’s e-services\textsuperscript{201}. The Look@World Foundation helped to facilitate the adoption of the ID-Card through allocation of Foundation funds for the installation of ID-Card readers at various public internet access locations\textsuperscript{202}. Additionally, multiple banks, which were prominent members of the Foundation, agreed to accept the ID-Cards as the preferred form of customer authentication, which provided a strong incentive for citizen adoption of the ID-Card within their daily lives\textsuperscript{203}. In more recent years, the Look@World Foundation has continued to promote digital learning opportunities for adults, including coordinating the 2017 launch of the National Digital Skills and Jobs Coalition, commissioned through a public procurement by the Estonian Ministry of Economic Affairs and Communications (also a member of the National Coalition), which brings together Nonprofits, private companies, and public sector for the purpose of continuing the development of digital skills within the Estonian population\textsuperscript{204}.

Returning to the founding of the Look@World Foundation, it is important to understand that there was an explicit and well-defined component of cooperation between the Foundation and the State. In expressing his vision for how the Look@World Foundation would fill the gap within the existing scope of digitization efforts, Hansapank’s Alar Ehandi stated “It is obvious, therefore, that Look@World should not finance projects which would be undertaken by the private sector in any event. On the other hand, we must also not take up projects which are the obligation of the state and which are a part of the state’s plans anyway. These considerations allowed us to conclude that the Look@World Foundation must finance and run projects which contribute to Internet use but which are neither attractive to the private sector nor are a part of

\begin{footnotesize}
\begin{enumerate}
\item Vassil, “Estonian E-Government Ecosystem: Foundation, Application, Outcomes”; “ID-Card.”
\item Mårja, “National Report of Estonia.”
\item Mårja.
\item “Estonian Digital Skills and Jobs Coalition — Look@World Foundation.”
\end{enumerate}
\end{footnotesize}
state planning and budgeting.”205. As Ehandi here alludes to, the partnership arrangement between the Foundation and the state advanced digitization on a national level beyond what the modest budget and limited technology at state disposal during this era would have allowed for. The impact of the projects carried out by the Look@World foundation, as well as other partners, on the adoption of e-government in Estonia points to how the Estonian government’s flexible approach to coordination with initiatives originating outside the public sector has been instrumental in the success of e-Estonia.

Shifting focus again to education policy, two policy documents are of particular importance in the government aim to build digital skills among the older population in Estonia, and thus increase user adoption of digital services. These two documents are: the Estonian Lifelong Learning Strategy 2014-2020 and The Education Strategy 2021-2035. Approved by the Estonian government in 2014, the Estonian Lifelong Learning Strategy 2014-2020 defined Lifelong Learning as “in-service education and retraining as well as non-formal and informal education in all its diversity.” alongside more traditional education systems206. This document cited the persistent gap in digital skills between different age demographics as one of the key problems to be addressed, stating “older generations have lower information processing skills and lack the courage to use computers”207. Section 4.5 of the Estonian Lifelong Learning Strategy 2014-2020 includes provisions to address these disparities under the heading, “Creating learning opportunities for adults to acquire digital competencies”208. The Education Strategy 2021-2035 is a follow up to the Estonian Lifelong Learning Strategy 2014-2020 and aims to

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205 Alar Ehandi, “The ‘Look@World’ Project: An Initiative from Estonia’s Private Sector to Boost Internet Use.”
207 The Republic of Estonia Ministry of Education and Research.
208 The Republic of Estonia Ministry of Education and Research.
“continue the development of digital competences and support the diversification of learning, including through digital solutions.”

Finally, another important way that the Estonian government has promoted user adoption of e-government services across age demographics is through policies that financially, or otherwise incentivise use of digital public services over traditional in-person offerings. For example, in the early days of the digital identity ID-Card, the Estonian government offered a 30% public transportation discount to people who registered to receive an ID-Card, resulting in a 213% increase in cardholders within 12 months\(^{20}\). Other examples include the Estonian Tax and Customs Board issuing income tax returns nearly a full month earlier for those that file digitally instead of on paper\(^{21}\), and the reduced fee of around 10 euros for those that register a license plate with the state online instead of in person at an office\(^{22}\).

### 4.4 User Rights, Privacy, and Security Policy

Much of the success of e-Estonia both from both a planning and user adoption standpoint stems from legislative action that codified the rights and protections for users early on in the digital development process. Proactive legislation in this area was formative in establishing norms for what types of government and private sector behavior would be considered acceptable in the creation and provision of digital public services and the parameters in which the information society would operate. A strong framework of user protection regulations has also contributed to the relationship of trust between the Estonian government and citizens - a factor

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211 “Income Tax Returns for 2022 | Estonian Tax and Customs Board.”
212 Vassil, “Estonian E-Government Ecosystem: Foundation, Application, Outcomes.”
213 e-Estonia Briefing Center, “The E-Estonia Presentation.”
central to public consent to use of digital services and the extensive collection of user data that the e-Estonia model entails.

As one of the most foundational national documents enumerating the rights of citizens, the Estonian constitution of 1992 contains key provisions that naturally also apply within the context of e-government. For example, in article 42 of the Estonian Constitution of 1992 it is written that “State agencies, local governments, and their officials shall not gather or store information about the beliefs of an Estonian citizen against the citizen’s free will.” 214 While article 42 contains no specific reference to the digital realm, the protections outlined in this article are reflected in a number of more specific policies such as those guaranteeing citizen control over personal data. Similarly, Article 44 of the Constitution states that, except in cases of criminal investigations and other outstanding circumstances, “An Estonian citizen has the right to access information about himself or herself held in state agencies and local governments and in state and local government archives, pursuant to procedure provided by law.” 215 This right is provided for through the Data Protection Inspectorate, a government agency established in 1999 and currently operating under the Ministry of Justice, which investigates breaches of information rights and assists citizens whose privacy rights have been violated in the processing of personal data, among other functions 216. In accordance with the Public Information Act of 2000, the inspectorate “exercise[s] state and administrative supervision over holders of information” 217. This authority “covers the public, private and third sectors as well as the activities of many

216 Estonian Data Protection Inspectorate, “Annual Report for the Year 2011 to the Constitutional Committee of the Riigikogu and the Legal Chancellor on Compliance with the Public Information Act and Personal Data Protection Act.”
217 “Public Information Act–Riigi Teataja.”
individuals (e.g. people who keep websites, write blogs, are members of social networks). The Data Protection Inspectorate remains the primary state institution responsible for overseeing the protection of citizen’s rights in the digital environment and functions in accordance with the requirement for “one or more public independent authorities” under Article 51 of the EU General Data Protection Regulation (GDPR). As the Estonian supervisory authority under the EU GDPR, the Estonian Data Protection Inspectorate is a member of the European Data Protection Board (EDPB), which promotes consistent application of data protection rules throughout the EU and promotes cooperation between various states’ authorities. However, a lack of funding relative to the supervisory authorities within other EU countries, as well as the broad range of responsibilities delegated to the Estonian Data Protection Inspectorate has frequently forced the Inspectorate to take a backseat position in EDPB proceedings. As Head of the Estonian Data Protection Inspectorate, Pille Lehis, wrote in the 2019 Annual Report, “Unfortunately, we have chosen to back out even in cases where the topic would have been interesting, as well as necessary for us: all due to the fact that acting as a rapporteur, i.e. a leader, in the Data Protection Board would require intensive work, which could only take place at the expense of other duties that require immediate action.” Those other duties range from previously mentioned ombudsman activities, to advising on draft legislation relating to data protection. In 2020 alone, the Data Protection Inspectorate provided policy advising to the

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218 Estonian Data Protection Inspectorate, “Annual Report for the Year 2011 to the Constitutional Committee of the Riigikogu and the Legal Chancellor on Compliance with the Public Information Act and Personal Data Protection Act.”
220 “Who We Are | European Data Protection Board.”
Ministry of Social Affairs, the Ministry of the Interior, the Ministry of Economic Affairs and Communications, the Ministry of Finance, the Ministry of Justice, the Ministry of Education and Research, and the Ministry of the Environment\textsuperscript{224}. The lack of funding and this broad range of activities has at times also inhibited the ability of the Inspectorate to enforce fines for regulatory violations, though the Estonian Data Protection Inspectorate still managed to enforce more fines in 2022 than respective bodies in the other Baltic states of Latvia and Lithuania\textsuperscript{225}. All things considered, smaller countries still in the process of setting up the institutional body, or bodies, responsible for supervision of citizen data protection may use the lesson learned from the Estonian case to consider exploring a greater division of responsibility within their own supervisory institution(s).

Going back to governing legislation, aside from the Estonian Constitution, one of the earliest pieces of legislation regulating data privacy was the 1996 Personal Data Protection Act (PDPA). Since amended by the Riigikogu in 2007 and 2010 the PDPA laid the foundation for three key areas relating to personal data which are: the conditions and procedure for processing of personal data, the procedures for state supervision in the processing of personal data, and liability for violations of the personal data processing requirements\textsuperscript{226}. This legal document is particularly important because at a high level, it legally confers ownership of citizen data to the individual citizen themself\textsuperscript{227}. Citizen ownership of personal data is a key element in fostering trust in the e-Estonia model as according the the e-Estonia Briefing Center, “the citizen owns his or her personal data and the government authorities only handle the data and have to ask for the explicit consent of the owner to share the data with other authorities.”\textsuperscript{228} Along these lines, the

\textsuperscript{224} Estonian Data Protection Inspectorate.
\textsuperscript{225} Daigle and Khan, “The Changing Tides of Data Protection Regulation and Enforcement in Europe.”
\textsuperscript{226} Vassil, “Estonian E-Government Ecosystem: Foundation, Application, Outcomes.”
\textsuperscript{227} Inspectorate, “Estonia.Ee, Protection of Personal Data and Privacy.”
\textsuperscript{228} e-Estonia Briefing Center, “The E-Estonia Presentation.”
PDPA established the necessity of user consent as a precursor to the processing of personal data and provided clarity as to what constitutes consent. For example, under the PDPA, “Silence or inactivity shall not be deemed to be a consent” and users may grant consent that is “partial or conditional.” These specific legal protections have had a significant impact on the technological build-out of e-Estonia. For example, the use of blockchain technology for integrity verification of major government registries such as The Electronic Health Record (e-Health Record) system enables users to see who has accessed their information and control viewing permissions, including even the ability to hide elements of their medical records from their doctors. With respect to the overall trajectory of e-Estonia’s development, it is important to note that the PDPA, passed in 1996, came before the passage of the Principles of Estonian Information Policy in 1998, which signals how the formal initiation of the Estonian information society came only after extensive legal protection for users was codified. In terms of technology and practice, this translated to a system proactively constructed in light of existing data protection regulation, as opposed to a system reformed based on violations - which could have had negative consequences for user trust and system functionality.

In 2018, the Riigikogu repealed the 1996 Personal Data Protection Act and replaced it with a new Personal Data Protection Act that went into effect on January 15, 2019. The New Data Protection Act maintains the aforementioned rights of citizens over their data but includes new developments that expand user rights such as requirements for data erasure upon subject’s request in certain circumstances, and mandatory notification of data subject in the case of severe

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229 Jackson, “The Right Mix.”
230 “Personal Data Protection Act–Riigi Teataja.”
231 “Personal Data Protection Act–Riigi Teataja.”
232 Jackson, “The Right Mix.”
233 e-Estonia Briefing Center, “The E-Estonia Presentation.”
234 “Personal Data Protection Act–Riigi Teataja (2018).”
personal data breaches. The 2018 Personal Data Protection Act also establishes significantly increased fines for violations, of up to 20,000,000 euros for the majority of data violations up from the former ceiling of 32,000 for the majority of violations.

Another piece of early legislation that has had a vital role in shaping the course of e-Estonia is the Public Information Act passed in 2000 and amended multiple times since. The stated purpose of the Public Information Act is to “ensure that the public and every person has the opportunity to access information intended for public use, based on the principles of a democratic and social rule of law and an open society, and to create opportunities for the public to monitor the performance of public duties.” Along these lines, this Act states that “Every person shall be afforded the opportunity to have free access to public information through the Internet in public libraries…” This can be seen as an early development in the widespread provision of free internet access that was a necessary precursor to e-government. The Public Information Act also lays the foundation for the “once-only principle” that has come to be a defining factor of e-Estonia. According to the “once-only principle”, any type of data related to an individual can only be collected once by a government institution and other government entities seeking the information must get it from that original collector. While multiple pieces of legislation underpin the “once only principle”, The Public Information Act was a key contributor in that it prohibited the establishment of multiple databases for the collection of the same data.

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235 “Personal Data Protection Act–Riigi Teataja (2018).”
236 “Personal Data Protection Act–Riigi Teataja (2018).”
237 e-Estonia Briefing Center, “The E-Estonia Presentation.”
238 “Public Information Act–Riigi Teataja.”
239 “Public Information Act–Riigi Teataja.”
240 “About Us - e-Estonia Briefing Centre.”
241 e-Estonia Briefing Center, “The E-Estonia Presentation.”
242 e-Estonia Briefing Center.
The year 2004 saw the passage of two other foundational pieces of legislation related to user rights and security in the context of e-Estonia - the Information Society Services Act and the Electronic Communications Act. The Information Society Services Act regulates services providers such as telecom companies and other entities that conduct activities that “involve the processing, storage or transmission of information by electronic means intended for the digital processing and storage of data.”\(^{243}\). This Act provides safeguards for consumers by ensuring that commercial communications are clearly identifiable as such and that service providers make accessible to consumers key information about the service provider such as the regulatory body with which the service provider is registered and fees charged for service, among other things\(^{244}\). The Information Society Services Act was amended in 2021 “under which the Consumer Protection and Technical Regulatory Authority is designated to exercise supervision over providers of online intermediation services and search engines, information society service providers are obliged to render accessible their VAT identification numbers and the penalty payment and fine rates for failure to comply with precepts and obligations are specified.”\(^{245}\) The Electronic Communications Act (ECA) provides further protection for consumers of electronic communication services by laying out additional requirements for the provision of communication services such as the guiding principle of ensuring “protection of transmitted or stored information”\(^{246}\).

More recently, the 2018 Cybersecurity Act provides further specification on regulations governing the notification of data subjects regarding cyber incidents and increased security measures required of operators of essential services and digital service providers\(^{247}\). Additionally,

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\(^{243}\) “Information Society Services Act–Riigi Teataja.”

\(^{244}\) “Information Society Services Act–Riigi Teataja.”

\(^{245}\) plats 1a et al., “The Riigikogu Amended the Information Society Services Act.”

\(^{246}\) “Electronic Communications Act–Riigi Teataja.”

\(^{247}\) “Estonia.”
the Act specifies responsibilities of the Information System Authority (RIA), stating that “Ensuring cybersecurity and preventing and resolving a cyber incident to the extent provided by this Act shall be coordinated by the Estonian Information System Authority”\textsuperscript{248}.

As previously touched upon, Estonia’s accession to the EU in 2004 has also added an additional layer of legislative protections for users of e-government\textsuperscript{249}. Most notably, The European Union’s General Data Protection Regulation (GDPR) implemented in 2018 provides the overall framework governing personal data and privacy rights within EU and the European Economic Area (EEA) member states\textsuperscript{250}. While Estonia is subject to regulation under the broader authority of the EU, there has been a great deal of reciprocity of ideas and information related to cyber security and e-government. For example, the Estonian presidency of the Council of the EU between 1 July - 31 December 2017 resulted in the signing of the Tallinn Declaration on eGovernment which seeks to bring the Estonian concept of the once-only principle to the entirety of the EU\textsuperscript{251,252}. The article released by the European Commission upon the signing of this document highlights the primary objectives of the Declaration, stating that “Member States reaffirmed their commitment to progress in linking up their public eServices and implement the eIDAS regulation and the once-only principle in order to provide efficient and secure digital public services that will make citizens and businesses lives easier.”\textsuperscript{253} The successful adoption of the Tallinn Declaration on e-government also serves to demonstrate how Estonia is blazing the trail for developments within the broader, international scene of government digitization.

\textsuperscript{248} “Cybersecurity Act–Riigi Teataja.”
\textsuperscript{249} “Estonia in the European Union | Välisministeerium.”
\textsuperscript{250} Daigle and Khan, “The Changing Tides of Data Protection Regulation and Enforcement in Europe.”
\textsuperscript{251} e-Estonia Briefing Center, “The E-Estonia Presentation.”
\textsuperscript{252} “Ministerial Declaration on eGovernment - the Tallinn Declaration | Shaping Europe’s Digital Future.”
\textsuperscript{253} “Ministerial Declaration on eGovernment - the Tallinn Declaration | Shaping Europe’s Digital Future.”