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The Development of eServices in an Enlarged EU:

eGovernment and eHealth in Estonia

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ACKNOWLEDGEMENTS

PREFACE

Policy context

At the European Council held in Lisbon in March 2000, EU-15 Heads of Government set a goal for Europe to *become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion.* The renewed Lisbon goals of 2005 emphasize working for growth and jobs, and include plans to facilitate innovation through the uptake of ICT and higher investment in human capital.[1]

Information and Communication Technologies, and related policies, play a key role in achieving the goals of the Lisbon strategy. In 2005, the new strategic framework for Information Society policy - i2010[2] - identified three policy priorities: the completion of a single European information space; strengthening innovation and investment in ICT research; and achieving an inclusive European Information Society.

All three priorities, and especially the last one, consider public services to be a key field for the application of ICT, because of the impact that ICT-enabled public services could have on economic growth, inclusion, and quality of life. Within this framework, policy actions have been taken in fields such as e-government[3] and e-health.[4] Public services have also been included as application fields for ICT in the 7th Framework Programme for Research and Development[5] and in the ICT policy support programme of the Competitiveness and Innovation Programme (CIP).[6]

Research context

IPTS[7] has been researching IS developments in acceding countries[8] since 2002.[9] The outcomes of this prospective research, which aimed to identify the factors influencing Information Society developments in these countries and the impacts these developments have on society and the economy, point to the need for better understanding the specific contexts in each member state for the take-up of e-applications, in particular eGovernment, eHealth, and eLearning. These key application areas have an impact not only on the relevant economic and public service areas but also on the development of the knowledge society as a whole.

Taking the above into account, IPTS launched a project to support eGovernment, eHealth and eLearning policy developments managed by DG INFSO and DG EAC. The research, which was carried out by a consortium led by ICEG EC in 2005, focused on the three application areas in the ten New Member States[10] that joined the European Union in 2004, in order to build up a picture of their current status and developments in the field, the most important opportunities and challenges they face, the lessons other member states may learn from them, and the related policy options. National experts from each country gathered the relevant qualitative and quantitative data for analysis, in order to develop a meaningful assessment of each country's current state, and trajectory, and to find out the main factors. This allowed them to derive the relevant conclusions in terms of policy and research.

The IPTS team designed the framework structure for the research, the research questions and methodology. This team and the consortium coordinator jointly guided the national experts in their

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[1] http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm

[2] "i2010 – A European Information Society for growth and employment" COM(2005) 229

[3] "I2010 eGovernment Action plan" COM(2006) 173

[4] "e-Health - making healthcare better for European citizens" COM (2004) 356

[5] See http://cordis.europa.eu/fp7/ict/ and Official Journal L 412 of 30/12/2006

[6] Official Journal L 310/15 of 9/11/2006

[7] Institute for Prospective Technological Studies, one of the seven research institutes that make up the Joint Research Centre of the European Commission

[8] Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, and Turkey

[9] For a list of complete projects and related reports see http://fiste.jrc.es/enlargement.htm

[10] Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovenia and Slovakia

work through workshops, extended reviews and editing of the various interim reports. Data sources such as international and national survey data, literature, policy documents, and expert interviews were used to capture the most recent situation of the country.

In addition to national monographs describing eGoverment, eHealth and eLearning developments in each country, the project has delivered a synthesis report, based on the country reports, which offers an integrated view of the developments of each application domain in the New Member States. Finally, a prospective report looking across and beyond the development of three chosen domains was developed to summarize policy challenges and options for the development of the Information Society towards the goals of Lisbon and i2010.

eGovernment and eHealth in Estonia

This report was produced by Institute of Humanities and Social Sciences of Tallinn University of Technology, the consortium member from Estonia, with the involvement of experts from PRAXIS Centre for Policy Studies, and it presents the results of the research on eGovernment and eHealth in Estonia.

First, it describes Estonia's government and health system and the role played by eGovernment and eHealth within this system. Then, the major technical, economic, political, ethical and socio-cultural factors of the eGovernment and eHealth developments, as well as the major drivers and barriers for them in the country, are assessed. These provide the basis for the identification and discussion of policy options to address the major challenges and to suggest R&D issues for facing the needs of the country. The report reflects the views of the authors and does not necessarily reflect the opinion of the European Commission. Its content has been peer reviewed by national experts, ICEG EC, and IPTS.

In this study, **eGovernment** (European Commission COM (2003)567) is defined as the use of information and communication technologies in public administrations, combined with organisational change and new skills, to improve public services and democratic processes and strengthen support to public policies. Thus, it encompasses the dimensions of public administration, democracy, governance and policy making.

Furthermore, the vision of eGovernment in the EU for the next decade as a tool for better government in its broadest sense should be taken into account when considering the scope of eGovernment developments. This vision places eGovernment at the core of public management modernisation and reform, where technology is used as a strategic tool to modernise structures, processes, the regulatory framework, human resources and the culture of public administrations to provide better government, and ultimately, increased public value.

The creation of public value is a broad term that encompasses the various democratic, social, economic, environmental and governance roles of governments. Concrete examples of these roles are: the provision of public administration and public services (health, education, and social care); the development, implementation and evaluation of policies and regulations; the management of public finances; the guarantee of democratic political processes, gender equality, social inclusion and personal security; and the management of environmental sustainability and sustainable development.

eHealth is defined as the use of modern information and communication technologies (ICTs) to meet the needs of citizens, patients, healthcare professionals, healthcare providers, and policy makers. It makes use of digital data, transmitted, stored and retrieved electronically, for clinical, educational and administrative purposes, both at local sites and at a distance from them. Hence the study looks into the use of ICT in public health policy and prevention of disease, information services to citizens, integrated patient management and patient health records, and telecare and independent living services applications.

From Autumn 2007, all reports can be found on the IPTS website at: http://www.jrc.es/

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List of abbreviations

ADSL	Asymmetric Digital Subscriber Line
CEE	Central and Eastern Europe
CVD	Cardiovascular Disease
EEBone	Government Backbone Network in Estonia
EENet	Estonian Educational and Research Network
EHF	Estonian E-Health Foundation
EHIF	Estonian Health Insurance Fund
EHIS	Estonian Health Information System
EMR	Electronic Medical Record
ERDF	European Regional Development Fund
EU	European Union
FD	Family Doctor
FDI	Foreign Direct Investment
GIS	Geographic Information System
HIV	Human Immunodeficiency Virus
ID Card	Identity Card
ICT	Information and Communications Technology
ISP	Internet Service Provider
LAN	Local Area Network
MoSA	Ministry of Social Affairs of Estonia
NATO	North Atlantic American Treaty Organisation
NHIS	National Health Information System, Estonia
NGO	Non-Governmental Organisation
NPM	New Public Management
OECD	Organisation for Economic Co-operation and Development
OPD	Out-Patient Department
PC	Personal Computer
PKI	Public Key Infrastructure
PPP	Public Private Partnership
R&D	Research and Development
RIKS	State Infocommunication Foundation, Estonia
RISO	Department of State Information Systems, Ministry of Economic Affairs and Communications, Estonia
ROI	Return On Investment
SAIS	Enrolment Information System (*SissAstumise InfoSüsteem*), Estonia
SOE	Statistical Office of Estonia
PPP	Public-Private Partnership
TOM	Portal Today I Decide (*Täna Otsustan Mina*)
TUC	Tartu University Clinic, Estonia
UNDP	United Nations Development Program
WAI	Web Accessibility Initiative
WCAG	Web Content Accessibility Guidelines
WHO	World Health Organisation
WiFi	Wireless Fidelity
WiMAX	Worldwide Interoperability for Microwave Access
WWW	World Wide Web
X-Road	Data Exchange Layer X-Road
XML	Extensible Markup Language

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INTRODUCTION

General data

Official name: Republic of Estonia **Area:** 45,227 sq km. (2006) **Administrative division:** Estonia is divided into 15 counties comprised of 227 local governments (33 cities and 194 rural municipalities) (2006). Tallinn, its capital has 0.4 million population. **Population:** 1,344,684 (2006) **Households:** 566,847 (2005) **Ethnic nationalities:** Estonians (68.5%), Russians (25.7%), Ukrainians (2.1%), Belorussians (1.2%), Finns (0.8%) (2005) **Main languages:** Estonian (official) and Russian **State system:** Democratic parliamentary republic Constitution was adopted in 1992.	**Figure 1. Map of Northern Europe** Source: REGIO

The people elect the *Riigikogu* (parliament) and executive power is vested in the Government, with the President of the Republic as the head of State.

Currency: The national currency is the Estonian kroon (1 kroon = 100 cent), which was issued in 1992. The Estonian kroon is pegged to the Euro at a rate 1 EUR = 15.6466 EEK.

International Organizations: Estonia is member of the United Nations and the Organisation for Security and Co-operation in Europe (OSCE) since 1991, the Council of Europe since 1993 and the World Trade Organization (WTO) since 1999. It also became a member of the North Atlantic American Treaty Organisation (NATO) on 29 March 2004 and acceded to the European Union on 1 May 2004.

*Table 1. Key macroeconomic indicators of Estonia***:**

Indicator	Value	Reference year
GDP, billion EUR	10 540.2	2005 (Statistical Office of Estonia, SOE)
GDP per capita, EUR	7 830.2	2005 (SOE)
GDP real growth, %	9.8	2005 (Eurostat)
GDP per capita in PPS, (EU25 = 100), %	60.1	2005 (Eurostat)
Economic structure	Services: 66.3% Industry: 29.3% Manufacturing: 18.2% Agriculture: 4.4%	2004 (World Bank)
Employment rate (15-74 years), %	57.9	2005 (SOE)
Unemployment rate (15-74 years, %)	7.8	2005 (Eurostat)
Labour productivity per person employed[11]	58.6	2005 (Eurostat)

Sources: International Monetary Fund 2006, Eurostat 2006, Statistical Office of Estonia 2006, World Bank 2006.

Estonia's economic transition to a market economy started with a low GDP per capita and productivity (*Commission's Analysis of the Estonian National Reform Programme...* 2006). Since the restoration of its independence, the country has aggressively pursued integration with the West as well as a free market economy. The Estonian economy is characterized by a balanced budget, a flat-rate income tax, a free trade regime, a fully convertible currency, a competitive commercial banking sector, and a conducive environment for foreign investment.

> *Box 1. Estonia in some indexes:*[12]
>
> – World Economic Forum, Country Competitiveness Index: Rank 25 in 2006, Rank 26 in 2005
> – IMD, World Competitiveness Index: Rank 20 in 2006, Rank 26 in 2005
> – Fraser Institute, World Economic Freedom: Rank 12 in 2006 (using 2004 data)
> – UN Human Development Index: Rank 38 in 2005, Rank 36 in 2004)
> – Transparency International, Corruption Perceptions Index: Rank 27 in 2005, Rank 31 in 2004

Since 1995, the Estonian economy has grown at an average of over 6% a year, making it a star performer in the EU together with Ireland, which averages 7.4%. The real GDP growth in 2005 was 9.8% compared to the EU average of 1.6% (Eurostat 2006).

Furthermore, the economic growth in Estonia has been supported by continuous rapid growth of productivity, which has been in compliance with the wage growth. As a result, the Estonian GDP per capita, taking into account the purchasing power parity, has increased from 50% of the EU average in 2003 to 60% as of 2005 (*Action Plan for Growth and Jobs 2005–2007...* 2005, Eurostat 2006).

However, since productivity and wage growth started remarkably low, the high growth rates at the beginning of the new millennium have not significantly decreased differences in terms of productivity between Estonia and the leading EU-25 countries. With its relatively low productivity of 58.6% in 2005, Estonia trails EU-25 in the area of productivity as an economic indicator (Eurostat 2006).

The economic growth in recent years is mostly supported by a remarkable increase in exports. In 2005, around 80% of Estonia's total trade was with EU member countries (Bank of Estonia 2006) and real growth in exports of goods and services has increased by 21.3% in 2005. Growth in industrial production shows an upward trend starting from the year 2000. By January 2005, industrial production as a whole grew 12%, with manufacturing growing 11% (SOE 2006). Domestic demand has been growing as well, with real growth rates of private consumption accelerating by 8.1% in 2005. Private

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[11] GDP in Purchasing Power Standards (PPS) per person employed.
[12] For a critical discussion of competitiveness indices, refer to Lall 2001.

consumption has boomed due to positive development of the labour market, favourable loan conditions to households, and consumers' improved confidence on the economy. The high investment activity of the business sector can be attributed to the low interest rates and FDI inflow (*ibid*).

Table 2. Share (%) of components of GDP by expenditure approach at current prices

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Private consumption expenditure	54.7	58.2	57.3	57.5	56.8	55.7	55.9	56.8	56.4	54.3	52.1
General government final consumption expenditure	27.4	25.4	22.7	21.8	22.4	20.2	19.3	19.2	19.4	19	18.2
Consumption expenditure of non-profit institutions serving households	1.0	1.0	1.0	1.0	1.1	1.1	1.3	1.6	1.6	1.7	1.7
Gross fixed capital formation	25.9	26	27.7	29.9	24.7	25.6	26.9	28.7	28.9	28.4	29.1
Change in inventories	0.7	1	2.7	0.4	0.2	2.2	2.2	3.1	3.1	2.8	2.7
DOMESTIC DEMAND	109.7	111.7	111.4	110.7	105.2	104.9	105.7	109.3	109.4	106.2	103.8
Exports of goods and services (f.o.b.)	68.5	63	73.3	75.2	72.2	88.4	84	74.3	74.3	78.4	84.2
Imports of goods and services (f.o.b.)	76.1	74	84.3	85.1	76.9	92	87.4	81.4	81.9	86.1	90.3
Statistical discrepancy	-2.1	-0.6	-0.5	-0.9	-0.6	-1.2	-2.3	-2.2	-1.9	1.5	2.3
TOTAL	100	100	100	100	100	100	100	100	100	100	100

Source: Statistical Office of Estonia 2006

In the past few years, employment indicators have turned positive, indicating the rapid economic growth in Estonia. Employment rate of the population aged 15-74 in 2005 was 56.8% (SOE 2006; *cf.* Eurostat 2006 where employment rate of population aged 15-64 in 2005 was 64.4%, which is as almost the same as the EU-15 average of 65.2%). With 52.4% share of older workers in the employment market, it is comparable to Scandinavian countries and one of the highest in the EU. Further, the 7.9% unemployment rate in Estonia is lower than the EU-25 average of 8.7% (Eurostat 2006).

While there has been a considerable improvement in the employment rate since the year 2000, there is a mismatch of skills among workers. Workers laid off in traditional sectors have not been able to find jobs in the new service and high-tech sectors (World Bank 2006), especially in the Northeast region with 16.2% unemployment rate (see Table 3).

Table 3. Unemployment rate, %, 1995-2005

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Whole Estonia	9.7	9.9	9.6	9.8	12.2	13.6	12.6	10.3	10	9.7	7.9
Northern Estonia	8.4	8.5	8.5	9.1	10.2	11.5	11.6	8.6	9.6	9.6	7.5
Central Estonia	6.7	7.9	8.9	8.4	12	14.9	11	9.7	7.9	7.8	5.1
North-Eastern Estonia	15	14.6	13.3	14.7	20	21.1	18	18.9	18.2	17.9	16.2
Western Estonia	5.8	7.9	7	7.9	11.8	11.8	11	9.2	7.8	5.6	5.7
Southern Estonia	12	11.6	11	10	11.6	13.4	12.8	9.3	8.3	8.1	6.3

Source: Statistical Office of Estonia 2006

Demography indicators

The population of Estonia has constantly declined since the 1990s. In the early years the primary reason for this decline was migration, the age structure of the population has clearly changed in the last few years. The restoration of independence can be considered as the starting point for the ageing trend of the population through the constant increase of people aged 65 years old and older, and the sudden drop in birth rate. The latter can be directly linked to social distress due to plunging economy

in the early 1990s. The same period was marked with high incidence of premature (i.e., under 65 years) deaths from all causes, but most remarkably from external causes such as injuries, alcohol poisonings, traffic accidents, etc (see also Figure 2).

Figure 2. Births, deaths and natural increase, 1990-2004
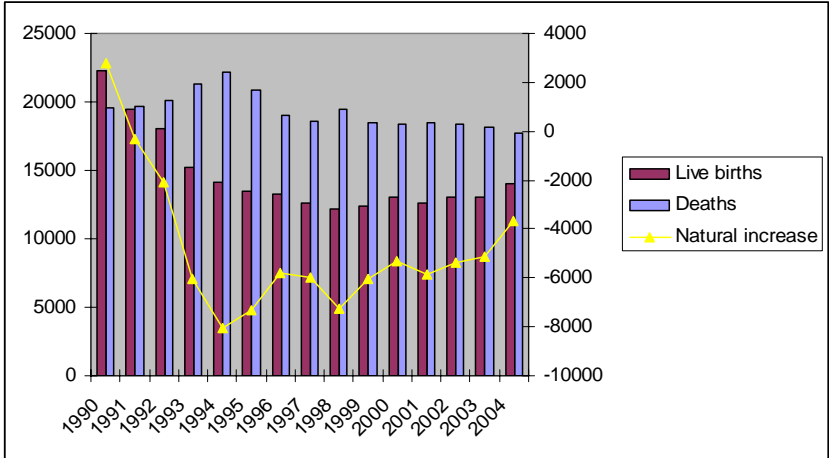
Source: Statistical Office of Estonia 2006

At the end of the 1930s life expectancy in Estonia matched that of the Scandinavian countries. However, the Second World War and the Soviet occupation led to a decrease and then stagnation in life expectancy. Prior to the economic transition, average life expectancy was at its highest in 1988 (i.e., 71 years), but soon fell to a low 67 years in 1994. Since the mid-1990s it has perpetually risen, reaching 72 years in 2004. There is a marked difference in trends in female and male life expectancy in Estonia with women's life expectancy 11 years higher than that of men. Women life expectancy, which is 78 years in 2004 is only 4-5 years behind the EU average. On the other hand, male life expectancy in 2004 was 66, and still has not equalled its high of 66.5 years in 1988. The main difference in life expectancy between men and women stems from premature deaths of men due to cardiovascular diseases and a number of external causes. Life expectancy in Estonia is currently 9 years lower than the EU average.

The decrease in the number of children and the increase in life expectancy have inevitably raised the proportion of older people in the population. Today, Estonia is one of the fastest ageing countries in Europe. The percentages of those over 65 were 11.5% in 1990 and 16.2% in 2004. By 2050 it is estimated that this will increase to 27% of the population (*Action Plan for Growth and Jobs…* 2005).

According to forecasts, the Estonian population will decrease to about 17–18% within 50 years. The forecast assumes that the birth rate will increase compared to the current level, but will not increase significantly to guarantee the 2.1 children per woman necessary to maintain the population. It is projected that by 2050, the gross birth rate coefficient will reach 1.6 (in 2001 it was already 1.39). As a result of the low birth rate and sudden increase in the average life expectancy, the ratio of working people and pensioners is seen to decline (*Action Plan for Growth and Jobs…* 2005).

Figure 3. Age pyramid for Estonia for the year 2020
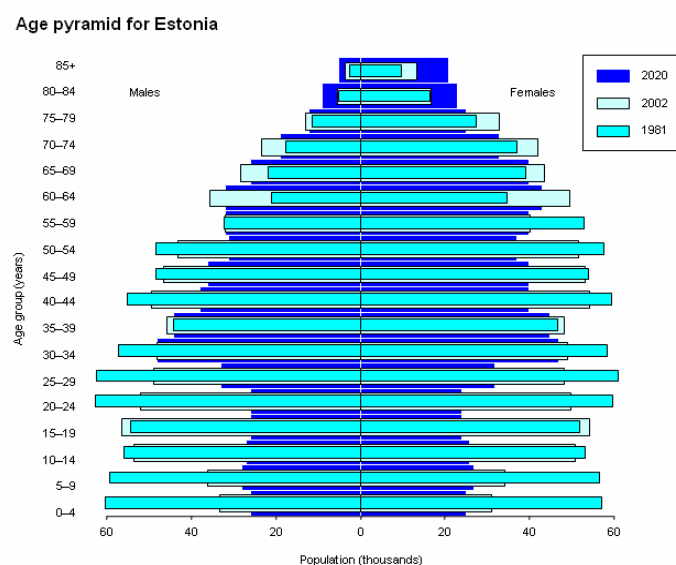
Sources: WHO Regional Office for Europe (2005) and United Nations (2005).

Source: World Health Organisation, Regional Office for Europe, 2005

In recent years, there is a tendency of internal migration towards the bigger cities and towns of Tallinn, Tartu, and Pärnu (for a map of Estonia, see Annex 1), which is mainly for two reasons. First, well-off citizens are in search of better living environment conveniently located from their place of work. Second, high unemployment rates in rural areas prompt people to migrate with the hope to of getting jobs. A more general tendency is the movement of the population from the rural regions of Southern Estonia to Northern Estonia. The so-called pendulum-travelling can be considered as a trend in Estonia: 18% of the total number of working population, or 115,000 people, work outside their home municipalities; and 7% of the working population have jobs requiring movement from one place to another (Eurodice, Eurobase).

Table 4. Population by area and density

	2001			2005		
	Population	**Area, km²**	**Density, inhabitants per square kilometre**	**Population**	**Area, km²**	**Density, inhabitants per square kilometre**
Whole country	1 366 959	43 432.3	31.5	1 347 510	43 432.3	31
Cities	921 298	674.4	1 366.1	898 136	688.6	1 304.4
Rural municipalities	445 661	42 757.9	10.4	449 374	42 743.8	10.5

Source: Statistical Office of Estonia, 2006

General government indicators

Estonia is one of those countries in the EU, which have already achieved a balanced or surplus fiscal position as determined by the *Stability and Growth Pact* (*Action Plan for Growth and Jobs…* 2005). In 2005, Estonia achieved a fiscal surplus of 1.6% of GDP, -2.3 as EU level indicator (Eurostat 2006). The improvement of its fiscal position in recent years is due to the rapid decrease in the deficits of the local authorities, as well as by the reduction in the surplus of the Social Security Funds and the government sector (*Action Plan for Growth and Jobs…* 2005). In addition, government's debt as a percentage of GDP is considerably small compared to 2005 EU average. In 2005, Estonia had the lowest ratio of government debt to GDP (4.8%) compared to EU's 63.4% (Eurostat 2006).

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Table 5. General data on government

	1995	2000	2005	EU-25 in 2005
General data on the public sector				
Revenues in % of GDP	**44.0**	**37.9**	**38.5**	**45.2**
Direct tax revenues in % of GDP[13]	10.9	8.1	7.6	12.9
Indirect tax revenues in % of GDP[14]	13.9	12.9	14.4	13.6
Capital incomes in % of GDP[15]	5.0	3.9	4.1	2.4
Social contributions in % of GDP	13.1	11.6	11.3	14.1
Composition of the revenues (in % of total)				
Direct tax revenues	31.5	34	37.4	30.2
Indirect tax revenues	24.9	21.4	19.8	28.5
Capital incomes[16]	0.07	0.7	1.9	1.3
Social security contributions[17]	29.8	30.6	29.0	29.1
Share of local government revenues in total revenues (%)			23 (in 2004)	25 (in 2004)
Expenditures in % of GDP	**43.6**	**38.3**	**36.9**	**47.5**
Composition of expenditures (in % of total)				
current expenditures[18]	55.2	60.0	62.7	69.6
capital expenditures[19]	4.0	3.5	0.9	2.5
Major expenditure items				
Employees compensation/GDP	11.7	11.0	10.1	10.9
Public services/GDP			3.2 (in 2004)	
Economic affairs/GDP			4.4 (in 2004)	
Social protection/GDP			11.0 (in 2004)	

Sources: Eurostat 2006, calculations by authors.

General health sector indicators

The level of healthcare expenditure in Estonia is mainly determined by wage levels (which in turn form the basis for public health insurance) and rising private expenditure on drugs and dental care. Health expenditure is quite modest relative to new member states. Since 2000 it has stalled at around 5.5% of GDP, giving much concern about the sustainability of current principles of financing.

The substantial decline in financing for healthcare (i.e., total expenditure on healthcare from both the public and private sectors) over the past years can be attributed to the downward trend in *public* expenditure (Jesse et al. 2004). To an extent, the reduction in public expenditure for health is compensated by the increased private expenditure - out-of-pocket payments for services, medicines and dental care. The Government however sees no concern regarding its decreasing contribution to total healthcare expenditure as it is close to the median among CEE countries – i.e., between countries with higher public shares in healthcare expenditure like the Czech Republic, Slovenia and Slovakia, on the one hand; and countries with lower public shares like Latvia, Lithuania and Hungary, on the other.

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[13] Current taxes on income, wealth etc.
[14] Taxes on production and imports.
[15] General government gross fixed capital formation.
[16] Capital transfers, receivable.
[17] Actual social contributions, receivable.
[18] Includes compensation of employees; subsidies payable; property income, payable; social benefits other than social transfers, payable; other current transfers, payable.
[19] Capital transfers, payable.

Table 6. Total health expenditure in Estonia (in EUR 1000s)

	2000	2001	2002	2003
Total healthcare expenditure	328 857	342 170	380 696	436 568
Percentage of total healthcare expenditure of GDP	5.54	5.13	5.1	5.36
Sources of financing, %	100.0	100	100	100
national health insurance	66.0	67	65.6	65.2
state budget	8.4	8.2	8.1	8.8
local government	2.0	2.6	2.6	1.5
private sector	23.3	22.2	23.7	24.5
Households	19.7	16.8	19.9	20.7
Insurance	1.0	1.1	1	1
Employers	2.6	2.3	2.8	2.7
foreign aid loan	0.3	-	-	-

Source: Ministry of Social Affairs 2005.

The Estonian Health Insurance Fund (EHIF) is the primary funding agency of health services in Estonia, which contributes 65% to the total healthcare expenditure. In addition to the provision of funds for health services and the compensation of medicines to the insured, EHIF also offers benefits for temporary incapacity to work. Table 7 shows the major components of the EHIF for the period 2003-2005. It indicates that the lion share of the EHIF expenditure goes to specialised medical care. Yet, allocations for general medical care (mainly, family doctors) and long-term nursing care are gradually rising from year to year.

Table 7. Estonian Health Insurance Fund expenditure 2003-2005

REVENUE (in EUR thousands)	2003 actual	2004 actual	2005 budget	2005 actual	2005 actual / 2005 budget %	2005 actual / 2004 actual %
Healthcare services benefits	229 057	259 466	302 507	301 459	99.7%	116.2%
Disease prevention	2 911	3 865	4 921	4 757	96.7%	123.1%
General medical care	29 060	31 423	38 794	37 846	97.6%	120.4%
Specialized medical care	181 566	206 985	239 541	239 847	100.1%	115.9%
Long-term medical care	4 795	6 083	7 286	7 281	99.9%	119.7%
Dental care service benefits	10 725	11 110	11 964	11 729	98.0%	105.6%
Health promotion expenses	882	862	639	547	85.6%	63.5%
Medicinal products compensated for to the insured	43 648	55 210	56 881	55 716	98.0%	100.9%
Expenditure on benefits for temporary incapacity for work	59 050	70 429	79 779	80 852	101.3%	114.8%
Other monetary benefits	4 313	4 630	5 332	5 098	95.6%	110.1%
Other benefit expenses	1 284	1 629	2 547	2 671	104.9%	164.0%
Total benefit expenditure	**338 233**	**392 225**	**447 685**	**446 343**	**99.7%**	**113.8%**

Source: Estonian Health Insurance Fund 2005

Mortality rate has been very high in Estonia over the last ten years despite its rapid decline in the early 1990s. Infant mortality has fallen twice over the last ten years. In 2003, for instance, 6.4 per 1000 live deaths were recorded. This rate is still higher than the EU average. Mortality rate is 77% higher for men (1553.4 in 2003) and 44% higher for women (748.6 in 2003) as compared to the EU average.

Table 8. Main mortality-based health indicators

	1995		2000		2004	
	Estonia	EU25	Estonia	EU25	Estonia	EU25
Life expectancy at birth, in years	67.77	76.56	70.95	77.94	72.02	78.49
Life expectancy at birth, in years, male	61.48	73.02	65.43	74.61	66.25	75.32
Life expectancy at birth, in years, female	74.35	80.03	76.31	81.15	77.78	81.55
Probability of dying before age 5 years per 1000 live births	19.02	8.02	10.84	6.22	9.05*	5.7
Infant deaths per 1000 live births	14.88	6.72	8.42	5.21	6.4	4.75
SDR all causes, all ages, per 100000, male	1,900.8	1,031.8	1,610.6	921.5	1,553.4*	876.0
SDR all causes, all ages, per 100000, female	898.13	597.57	788.66	543.6	748.61*	526.17

* - 2003.

Sources: WHO/EUROPE 2006, Statistical Office of Estonia 2006.

Main causes of death are diseases in the circulatory system, cancers and external causes (i.e., injuries). A comparison with cases in the EU shows that the most dramatic difference in standardised mortality rates are in deaths due to cardiovascular diseases (CVD) and external causes such as injuries and poisoning for men. Rates for such causes are three to four times higher in Estonia than EU average (see Figure 4).

Figure 4. Selected causes of death, Estonia-EU comparison
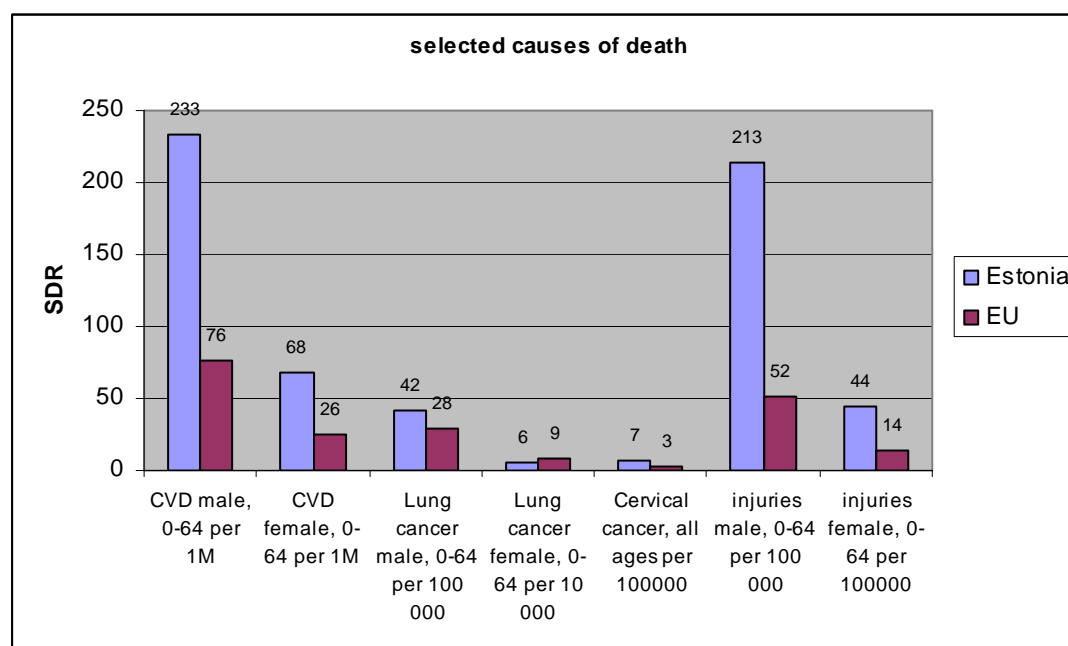
Source: WHO/EUROPE 2006. Data last year available

However, main health indicators have shown improvement over the last ten years, except for HIV-epidemics cases, which is becoming a major health challenge for Estonia. HIV incidence in 2004 was ten times higher than average in the rest of EU (see Table 9).

Table 9. Selected morbidity indicators

	1995		2000		2004	
	Estonia	EU	Estonia	EU	Estonia	EU*
Tuberculosis incidence per 100 000	42.32	18.57	51.19	14.35	39.8	11.85
Syphilis incidence per 100 000	71.97	3.67	44.18	2.65	15.51*	2.84
New HIV infections reported per 100 000	0.7657	2.98	28.48	3.6	55.07	5.34
New cases, diabetes mellitus per 100 000	...	...	254.54	...	297.27	...
Alcoholic psychosis incidence per 100 000	...	...	178.24	...	174.24	...
Hospital discharges, circulatory system disease per 100 000	2663.7	2207.3	3 239.3	2417.58	3386.89	2424.5
Absenteeism from work due to illness, days per employee	9.3	12.71	10	12.27	10	...

* - 2003. Sources: WHO/EUROPE 2006 and Statistical Office of Estonia 2006.

Figure 5. Healthcare resources Estonia-EU comparison
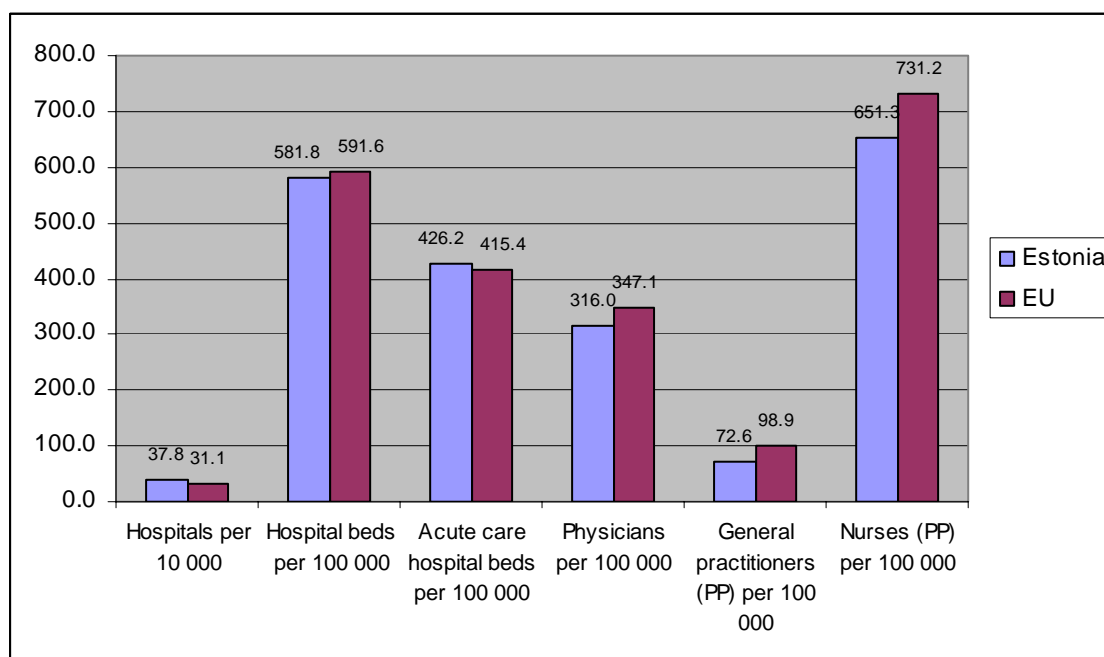
Sources: WHO/EUROPE 2006 and Statistical Office of Estonia 2006.

Estonia fares well at EU average in the area of healthcare resources and utilisation (see Figure 5). However, it must be noted that these indicators differ from country to country, and hence context-specific. The biggest difference in the indicators is on the relative low proportion of nurses – both nurse/doctor ratio and nurse/population ratio.

General ICT usage indicators

Over the years, Estonia has ranked high in various international comparisons measuring e-readiness not only among the Central and Eastern European countries, but also among the old EU member states and leading ICT-countries (see Krull 2003, *Information Society Benchmarking Report...* 2005, *eEurope+ Final Progress Report* 2004).

Box 2. Estonia's rank in international comparisons

The *Global Information Technology Report 2004-2005*, which uses a comprehensive tool for measuring the progress of and identifying the obstacles to ICT development worldwide, has ranked Estonia on the 25th position among the observed 104 countries. Estonia places second in the area of Internet banking, and third on eGovernment.

Economist Intelligence Unit has ranked Estonia 26th among the observed 65 countries, while considering it the leader in Central and Eastern Europe. However, the report notes that even though elements of e-readiness are in place in Estonia, its cumulative impact does not add up to e-leadership. Although excellent in eGovernment and online services, bottlenecks are related to limited infrastructure penetration and slow e-business and consumer adoption (*The 2005 e-readiness rankings...* 2005).

The UN Global E-government Readiness Report ranks Estonia as among the top 22 countries in its 2005 Web Measure Index (*UN Global E-government Readiness Report 2005*, 88).

Since January 2001, the Estonian telecommunications market has completely opened up competition in providing telecommunications services. The entire country is covered by mobile networks, with 419 100 households (81.1% of all households) becoming mobile phone subscribers in 2005 (Statistical Office of Estonia 2006).

Internet usage, which most characterises information society development, has been growing rapidly over the years. Surveys by TNS Emor[20] for 2006 indicate that 58% of people aged 15-74, or 60% of those aged 6-74, are Internet users (see Figure 6).

Figure 6. Internet users in Estonia
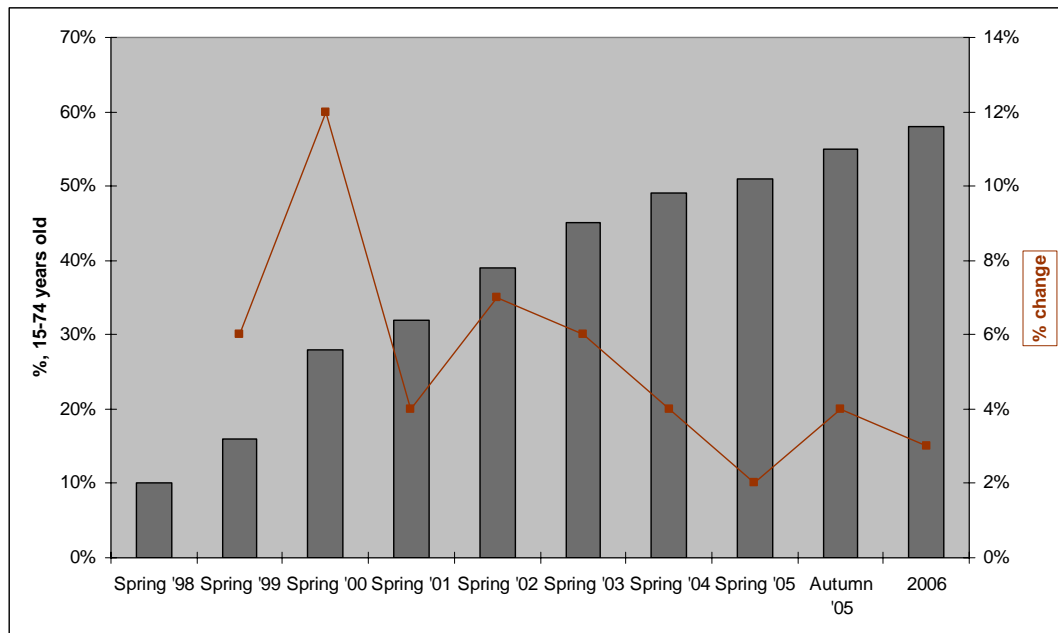
Source: TNS Emor 1998-2005

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[20] TNS Emor has carried out Internet usage survey for years and is currently the only regular national data provider of this kind of information. The basis for the data is TNS Emor e-track survey that includes interviews with 500 residents.

All other indicators are showing rapid developments as well. By the end of 2005, 55% of the population have become computer users. They use computer on a daily basis; the main motive for buying a computer is for the purpose of using the Internet. 68% of users use the Internet at home; while at the same time, the use of widespread public Internet access points has remained stable. Considering relatively low living standards, Estonia stands out by the fact that 73% of households having a home PC have connected it to the Internet via broadband connection (see Table 10). Among EU new member states, Estonia and Slovenia are leaders in broadband penetration (Gaspar and Jaksa 2005: 8).

Table 10. Information society indicators in Estonia

	2003 I	2003 II	2004 I	2004 II	2005 I	2005 II
Computer users						
(% of all respondents)	49%	51%	54%	50%	54%	56%
Home PC (% of all respondents)	35%	38%	40%	40%	45%	47%
Home PC in households (% of all households)	26%	31%	30%	32%	41%	40%
Frequency of computer use **(% of users who have used the computer in the last 6 months)**						
Daily	46%	52%	48%	56%	56%	55%
4-6 times per week	19%	16%	17%	15%	14%	16%
2-3 per week	11%	13%	13%	13%	12%	11%
once a week	8%	6%	8%	7%	6%	7%
2-3 times per month	7%	5%	7%	5%	5%	5%
once a month or less	9%	8%	7%	4%	8%	6%
Main motive for buying a computer (% of those intending to buy a computer)						
using the Internet	26%	28%	31%	30%	49%	50%
studying	17%	20%	21%	26%	23%	25%
working, creating a home office	19%	15%	19%	14%	18%	15%
playing games, for entertainment	3%	3%	2%	5%	7%	6%
Other	5%	4%	2%	3%	4%	4%

Internet users (% of all respondents)						
	45%	47%	49%	47%	50%	53%
Internet use by place of access **(% of Internet users in the last 6 months)**						
at home	49%	52%	56%	63%	68%	68%
at workplace	48%	46%	43%	47%	44%	42%
at a friend's home or work	24%	23%	25%	24%	26%	28%
at school	24%	25%	22%	22%	20%	20%
public Internet access point	16%	17%	17%	15%	13%	15%
Elsewhere	6%	4%	4%	3%	4%	3%
Types of home Internet connections (% of households with home PC)						
broadband connection	43%	52%	57%	72%	71%	73%
…(A)DSL connection					47%	48%
… cable modem					24%	25%
dial-up	24%	16%	14%	7%	7%	4%

Source: TNS Emor 1998-2005

On a regional basis, the share of home PCs and Internet usage are a bit higher in Tartu region and in Tallinn than in other parts of Estonia (see Table 11; for map of Estonia, see Annex 1). A study from 2002 showed that there are "Blue Collars" and "Passive People" among the non-users of the Internet in Estonia. "Passive People" are characterized by the following: most of the people in this group are 50 or older; they have relatively little interest in matters outside their daily life; their relation to the

Internet or to computers is very weak, they neither see any benefits in the Internet nor do they have any need to use it; they prefer to use the traditional media (even if the Internet were cheaper and more convenient), as apart from their general display of a lack of interest, they are constrained by the language barrier and are unable to handle the user interfaces of computers; they are also relatively less capable of learning and memorizing new things, and unwilling to change their habits. "Blue Collars" are mainly unskilled and skilled workers who do not need computers at their jobs; about half of the people in this group see no benefits in the Internet and are not willing to change their daily routines (Kalkun and Kalvet, 2002).

Table 11. Share of home PC and Internet users by regions, 2006

Regions	Home PC (% of all respond ents)	Home PC in households (% of all households)	Having no Internet connection	Internet users (% of all respondents)	Internet usage at home (% of those who used the Internet in the last 6 months)	Internet usage elsewhere[21] (% of those who used the Internet in the last 6 months)
Tallinn	58%	47%	6%	63%	76%	27%
North-Estonia	48%	41%	8%	57%	66%	39%
West-Estonia	53%	48%	17%	54%	71%	36%
Tartu region	62%	51%	11%	65%	79%	42%
South-Estonia	53%	39%	29%	55%	64%	46%
Viru County	50%	40%	15%	49%	71%	33%

Source: EMOR 2006

In the beginning of 2005, over 90% of the Estonian households lived in areas where it was possible to have broadband connection immediately. The cheapest cost for a broadband service per month is about 5% of the average wage. It is important to emphasize, however, there are some counties where average salary is lower and limited number of service providers resulting to higher cost of Internet service.

Surveys from 2006 show that the Internet is being used for: sending/reading e-mails (75%); using search engines (71%), seeking specific information from databases/web sites (70%), using Estonian Internet portals [e.g., delfi.ee and everyday.com] (67%), reading Internet publications (62%), random surfing (61%), and using communication software [MSN[22], ICQ,[23] etc.] (49%) (EMOR 2006).

The number of companies connected to the Internet is also on the rise. At the beginning of 2006, 97% of Estonian companies had a broadband Internet connection, with ADSL connection as the most popular. About 79% of the companies connected to the Internet also maintain a homepage on a web site (TNS EMOR 2006).

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[21] Usage of Internet outside a user's home – i.e., at workplace, friend's home/workplace, school, Public Internet Access Points
[22] 'MSN Messenger', instant messenger program.
[23] 'I Seek You', instant messenger program.

I: CURRENT GOVERNMENT AND HEALTH SYSTEM

I.1   Institutional structure of the general government

Estonia is a unitary and sovereign parliamentary democratic republic. The Estonian government upholds the principle of separation of powers (i.e., the executive, legislative and judiciary branches).

Estonian citizens elect a 101-member single chamber parliament every four years. The *Riigikogu*, a unicameral legislative body, is the highest organ of state authority with legislative powers. The Estonian legal system belongs to the civil law tradition and has, since independence, been mostly influenced by the German legal system. Different areas of law have been influenced by experiences of the Scandinavian and other Western European legal systems.

The *Riigikogu* also decides on the conduct of referenda, elects the Head of State (the President of the Republic), and authorizes the candidate for Prime Minister to form the Government of the Republic. The Prime Minister has full responsibility and control over his/her cabinet. The President, who is elected by the *Riigikogu*, serves for a five-year period and can be re-elected for a second and last term.

There are altogether seven constitutional institutions: *Riigikogu*, the President, the Government, the Bank of Estonia, the State Audit Office, the Chancellor of Justice and the Supreme Court.

There are principally two levels of government: the central government and local governments. The first level is the state or central government. County government represents the state at the regional level without any legislative power. Administratively, Estonia is divided into 15 counties, most of which with a population of 40 000 – 50 000. Each county is run by a governor and the county government. Both the governor and the county government staff members are civil servants of the central administration. There is no elected regional government. The main responsibilities of the 15 county governors are to represent the interests of the state in the county and ensure the comprehensive and balanced development of the county, as well as to co-ordinate the co-operation of regional offices of ministries and other agencies of executive power and local governments in the county (see Box 3).

Many state agencies and inspectorates, including those engaged in healthcare administration and funding, operate not on a county basis but through regional departments that cover two to four counties.

A ministry (11 ministries altogether) is the superior body of executive agencies and inspectorates, and of other state agencies within its area of jurisdiction. Ministries are responsible for strategic planning. An executive agency is a government agency provided by law which operates within the area of government of a ministry, has a directing function, exercises state supervision, and applies enforcement powers of the state on the bases and to the extent prescribed by law.

State inspectorates or agencies are government subsidiaries provided by law that operate within the area of government of a ministry, with the main function of exercising state supervision and enforcing powers of the state on the basis and to the extent prescribed by law.

Box 3. Various levels of Government in Estonia

Government of the Republic: holds executive power and executes the domestic and foreign policies of the state, directs and co-ordinates the activities of government agencies, administers the implementation of laws, etc.

County Governor and County Government: government agencies in the area of government of the Ministry of Internal Affairs. County governors represent the interests of the state in the county and care for the comprehensive and balanced development of the county. They monitor the activities of local governments. And with authorisation from the Government, they also conclude administration contracts with local governments for the performance of the latters' state obligations.

Local Government: all local issues shall be resolved and managed by local governments, which in turn shall operate independently pursuant to law. Duties may be imposed on a local government only by law or by agreement with the local government. Expenditure related to duties of the state imposed by law on a local government shall be funded from the state budget.

Sources: The Constitution of the Republic of Estonia, Government of the Republic Act

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The second administrative layer in Estonia consists of single-level local governments with a total of 227 - that is, 194 rural municipalities and 33 cities, each of which has a population size from about 100 to 400,000 people. . The capital city of Tallinn is the largest local government with 400,000 inhabitants. All local issues are managed and resolved autonomously by local authorities. Cities and rural municipalities have budgetary autonomy and local taxing powers. The state may impose additional powers and responsibilities on cities and municipalities only in accordance with law and/or under a binding agreement between them. Such additional powers and responsibilities imposed on a local government must be funded from the state budget. There are large differences in per capita tax revenues among different cities and rural municipalities. Revenues in Northern Estonia are much higher compared to those in Southern Estonia (see Annex 2).

As of 2004, there are around 19 386 employees in the Estonian central administration (excluding regular members of the defence forces). Of these, 2 773 work for ministries and 15 050 for executive agencies and state inspectorates. County governments employ 775 civil servants and constitutional institutions employ 788 (*Civil Service Yearbook...* 2005). Local government authorities employ around 4 000-5 000 people.

I.2   Involvement into governance

'Governance' is a 'new process of governing; or a changed condition of ordered rule; or the new method by which society is governed' (Rhodes 2000: 55). It is often used to refer to the development of governing approaches in which the boundaries of all three societal sectors – public, private and non-

profit – have become blurred as resource mobilisation is done across sectors and in which the trends of corporate management and marketisation have taken over (Kooiman 2003, Peters and Pierre 2003, Rhodes 2000, Stoker 1998). The concept and practice of governance brings with it the value of openness, transparency, accountability, and devolution of responsibilities and efficiency into the public sector.

Several authors have mapped the administrative capacity and governance problems in Estonia, concluding that the government is far from being a well-working entity and that administrative reforms have not been rational nor consistent (see, for example, Drechsler 2004, Randma 2001a and 2001b).

> **Box 4. Voter turnouts: parliamentary and local government council elections**
>
> Voter turnouts at elections in Estonia have been around 57%-69% for parliamentary elections and 47%-52% for local government council elections.
>
> | Election | Turn-out |
> |---|---|
> | Local Government Council Elections, 2005 | 47% |
> | Parliamentary Elections, 2003 | 58% |
> | Local Government Council Elections, 2002 | 52% |
> | Parliamentary Elections, 1999 | 57% |
> | Local Government Council Elections, 1999 | 50% |
> | Local Government Council Elections, 1996 | 52% |
> | Parliamentary Elections, 1995 | 69% |
> | Local Government Council Elections, 1993 | 53% |
>
> Source: Estonian National Electoral Committee 2006.

Yet, there is a general agreement about the persistence of problems of sector-interaction and of representation and participation caused both by the passive attitude of the government and by the general weakness of third sector organisations.

A recent study of the PRAXIS Center for Policy Studies mapped current procedures for engaging non-governmental organizations into regulatory decision-making processes (Lepa *et al.* 2004). In 2004, questionnaires were sent to committee chairpersons in the parliament and several related factions. PRAXIS received back 20 completed questionnaires from committees of the parliament, 39 from department heads of the ministries, and 136 from national representative organisations of NGOs and private enterprises. The study arrived at the following conclusions:

- A general framework for engaging NGOs in governance is available in various legal acts of Estonia, but this is not obligatory. Opinions of various parties on the basis for NGO engagement and participation, as well as the documents and practices that demand it, are rather different.

- Involvement of interest groups in decision-making is deficient, although major variations between ministries exist. There is also a contradiction that despite NGO interest in participating in decision-making processes, government officials consider it carries a risk that provisional ideas are taken as something already decided, making it difficult to reach fair and impartial judgement.

- Engaging national representative organisations is preferred by the government and it is rather difficult for new NGOs to enter the circle of established partners.

Other studies have as well put forward the argument that the design and coordination of public sector policies and involvement of the business sector is at a low level (Kalvet and Kattel 2006, Jürgenson *et al.* 2005).

I.3   The institutional framework and ownership of the healthcare system

Contemporary Estonian healthcare organisation is a result of two major reforms in the 1990s. First, the Soviet style state-controlled provider network was decentralised into independent legal entities. The second major shift was from centrally planned Semashko model of healthcare financing to Bismarckian-type social health insurance. This change happened in several phases, but basic principles have remained the same from the very beginning.

Current institutional framework and organisation of healthcare services is a result of last round of reforms between 2000i and 2002. Provider network is separated by law into primary and specialist care with clearly defined responsibilities. Emergency care, long-term care and nursing care are defined (see Box 5).

A retail sale of drugs is only permitted in registered pharmacies. Social care responsibilities are shared between central government and municipalities (for detailed description of reforms and current situation in Estonian healthcare organisation, see *Health Systems in Transition: Estonia 2004*).

Box 5. Provision of different healthcare services in Estonia

Primary healthcare services can be provided by family doctors, who may practice as self-employed individuals or establish a limited liability company (*äriühing*) providing primary healthcare services. Legal entity for primary healthcare cannot provide any other services except social services and research and teaching activities.

Emergency health services can be provided by a limited liability company, self-employed individual or state or local municipality establishment.

Specialist healthcare services can be provided by specialist doctors or dentists. Ambulatory services can be provided by a limited liability company, self-employed individual or a foundation. Hospital can operate as a limited liability company or a foundation.

Nursing care services can be provided by a certified nurse or obstetric nurse alone or together with family or specialist doctor or dentist. Legal entity for nursing care services can be a limited liability company, foundation or self-employed individual.

Source: The Healthcare Services Act

Figure 7. Health and social services organisation in Estonia
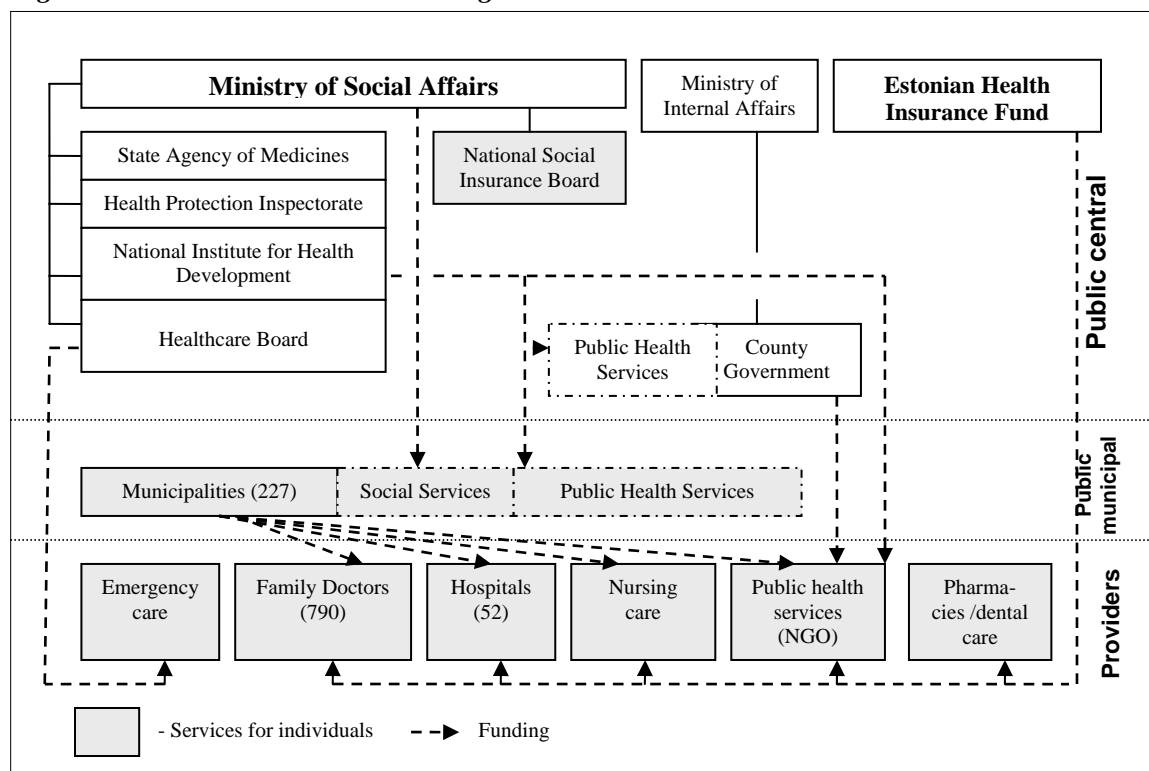
Source: Authors, based on the data from Ministry of Social Affairs

1.3.1 Central government

The Ministry of Social Affairs (MoSA) is the leading governmental body responsible for health, social and labour issues in Estonia. In addition to MoSA, the main bodies from the state that are responsible for planning, administration, regulation and financing of health and social services are Healthcare Board (HCB), State Agency of Medicines (SAM), Estonian Health Insurance Fund (EHIF), Health Protection Inspectorate (HPI), National Institute for Health Development and National Social Insurance Board (see Figure 7).

The Government (the Cabinet of Ministers) approves the development plan for the hospital network, defines healthcare prices (as the government must approve reference prices and the maximum level of health insurance benefits to be reimbursed by the EHIF) and approves regulatory acts involving wider public health issues. The government also has the right to nominate one member to the EHIF Supervisory Board in addition to the board's four other state representatives.

Main functions of the **Healthcare Board** include licensing of healthcare providers and registering of health professionals, controlling the quality of healthcare provision and funding and organizing emergency health services.
Responsibility for the registration and quality control of drugs and regulation of pharmaceutical trade, - including imports and marketing - lies with the **State Agency of Medicines**. This agency also ensures the safety of donated blood and tissue transplants. It has some responsibilities for the registration of medical technology.

The **Health Protection Inspectorate** enforces health protection legislation through four regional offices with local branches in each of the 15 counties, and is also responsible for communicable disease surveillance, national and local epidemiological services and implementation of the national immunization programme.

The **National Institute for Health Development** is the governmental research institute in the area of public health. It is also responsible for public health analysis, monitoring and reporting of health status

(including the maintenance of disease registries) and implementation of national public health strategies (programmes).

Apart from „civil" health and social service system there is a 'parallel' system for prisoners under the auspices and funding of the Ministry of Justice.

The **Estonian Health Insurance Fund** (EHIF) is a independent, public legal body with the main role of active purchasing agency, responsible for:
▪ contracting healthcare providers;
▪ paying for health services;
▪ reimbursing pharmaceutical expenditure; and
▪ paying for some sick leave and maternity benefits.

The main task of the **National Social Insurance Board** is the organization and co-ordination of grant and payment of the state pensions, benefits and compensations throughout its local offices.

1.3.2 Local government level

Local governments are responsible for the organisation and provision of social services to their respective constituencies. Rules and principles, however, are defined by the Ministry of Social Affairs. Although by law all healthcare providers are established as limited companies or foundations, most of them are owned or controlled through supervisory boards by local governments.

1.3.3 Provider network

All healthcare providers act legally under private law (see Box 5), although most of them are controlled by central or local government authorities through ownership and supervisory boards (see above). Yet, these entities are fully independent in financial and organizational terms.

Table 12. Independent healthcare institutions

Type of institution	Number of institutions				
	1999	2000	2002	2003	2004
Total hospitals	83	68	51	50	51
Regional hospital	-	-	3	3	3
Central hospital	-	-	4	4	4
Specialised hospital	18	11	5	5	6
General hospital	48	39	24	19	12
Local hospital	-	-	-	-	5
Rehabilitation hospital	-	-	2	3	3
Nursing care hospital	8	12	13	16	18
Other	9	6	-	-	-
Outpatient medical care institutions	300	540	625	697	711
General medical care institutions	-	367	439	476	479
including family doctor centres	-	292	435	469	471
Dental care institutions	181	264	384	426	433
Emergency care institutions	-	7	7	7	7

Source: Ministry of Social Affairs 2005.

Primary care is the corner stone of healthcare system in Estonia. There are 790 family doctors who functions as primary entry points to the system and they control access to most specialist services and hospital care. All individuals in Estonia belong to one of the family doctors who should principally hold the medical history of an individual and his/her family from birth to death.

Specialist and hospital care (both secondary and tertiary care) are legally separated from primary care or provision of pharmacy services. Hospital network is organised at different levels or types depending

on population base and complexity of services that are allowed to be provided. There are regional, central, general, local, special, rehabilitation and long-term care hospitals. Licence requirements or setting-up a hospital are stipulated in the regulation of the Minister of Social Affairs. There are 19 out of 52 hospitals that belong to so-called strategic Hospital Master Plan list defined by a Government Regulation. By law, hospitals in this list are the priority when central level investments - including EU structural funds - or long-term contracts with Health Insurance Fund are planned. Outpatient specialist care is usually linked to hospital out-patient departments (OPD). Some independent specialists practise privately, but most other specialists work in hospital OPDs.

Emergency health services are contracted out by the Healthcare Board. Service providers can be any legal entities fulfilling criteria for certification. There is one private-for-profit company that provides such services while the rest are foundations linked to municipalities or general emergency departments. This is the only health service type, which can be provided by public entities.

With the exception of out-patient clinics, there are very few healthcare providers fully established by private capital, even though all entities are regulated under private commercial or foundation law. Recently, however, there has been a tendency towards consolidation of primary, out-patient specialist and rehabilitation care into multifunctional polyclinics. This trend is increasingly attracting private capital.

Table 13. Practicing healthcare professionals

	1995	2000	2001	2002	2003
Doctors	4832	4477	4354	4268	4277
incl family doctors	104	448	557	701	803
Dentists	929	1034	1108	1077	1127
Nursing specialists and other graduates of medical schools	11416	10090	9942	9985	10268
incl nursing specialists	9948	8667	8547	8716	8815
Healthcare professionals per 10 000 inhabitants					
Doctors	33.9	32.8	32.0	31.5	31.7
incl family doctors	0.7	3.3	4.1	5.2	5.9
Dentists	6.5	7.6	8.1	7.9	8.3
Nursing specialists and other graduates of medical schools	80.1	73.9	73.0	73.6	76.0
incl nursing specialists	69.8	63.4	62.8	64.3	65.2

Source: Ministry of Social Affairs 2005.

Long-term and nursing care are provided mainly by acute care hospitals but are increasingly being offered by specialised entities often established through private capital. There are also few services that nurses can provide independently from doctors.

Public health services are also provided by several non-governmental organizations, but increasingly also healthcare providers as EHIF is increasing the funding (e.g., school health services and screening programmes).

1.3.4   Social care provision

The Law of Social Care and Welfare gives the Ministry of Social Affairs and the county governors the responsibility to organise social care by delegating to the municipal government the responsibility for social care and welfare of the local municipality. The Ministry of Social Affairs elaborates and implements the national policy of social care and welfare, the laws and other legal acts regulating social care and welfare, and other national programs and projects. The county government functions as the extension of the Ministry of Social Affairs in counties in delivering these services.

The local municipal government has the duty to organize and provide social services, social assistance, and other aid to individuals in need. There are different forms of social care, both in terms of delivery and financing. The main form consists of general services to assist individuals in need of social support. While such services are the responsibility of municipal governments, they are financed by

transfers from the central government budget. Most of these services are being provided in social care homes, although some municipalities have also developed systems of community care – for example, day care centres for older people, 'meals on wheels' and other assistance.

Services provided specifically for people with mental health problems or disabilities are the responsibility of the central government and are managed and financed centrally by the Ministry of Social Affairs and the state budget.

The number of social care institutions for adults has increased from 82 in 1995 to 117 in 2001. General social care institutions have increased from 68 to 97. Municipal governments have established several institutions with improved living conditions than the older and larger institutions.

Table 14. Institutions providing social welfare services

Type of service	Service providers, at the end of the year		Service users,…	
	2003	**2004**	**2003**	**2004**
Institutional welfare services for orphans and children without parental care	37	38	1835	1860
Institutional welfare services for adults (excl. persons with special .. needs)	108	112	5404	5997
Welfare services for the persons with special needs	71	80	4491	4698
incl. 24 hour care services	24	25	2413	2443
Rehabilitation services for disabled people	31	39	6599	9543
Rehabilitation services for adults with special needs	6	8	669	949
Day centre services	86	94	65069	55884
Housing services in the form of social housing, premises, support homes	83	85	3697	3907
Other services and rehabilitations service to ...	28	29	3243	3580
Night shelter services for the homeless	10	11	1712	2062

Source: Ministry of Social Affairs 2005.

1.4 Financing structure of the healthcare system

Healthcare in Estonia is largely financed publicly.[24] Taxes are the main source of healthcare finance, accounting for approximately two-thirds of total expenditure on healthcare over the last five years. Other public sources of healthcare finance include state and municipal budgets, accounting for approximately 9% and 1.5% of total healthcare expenditure, respectively. The share of public spending on healthcare has declined from 80.7% in 1998 to 75.5% in 2002 (See Table 6 in Introduction).

The EHIF is independent public legal public independent body responsible for health insurance. At the end of 2003 the EHIF covered 94% of the population (1 272 051 people). Entitlement to EHIF coverage is based on residence in Estonia and membership of specific groups defined by law. There is no possibility of opting out. The only group excluded from coverage is the prison population, whose healthcare is organised and paid for by the Ministry of Justice (see the section on Organizational structure and management). Employees and self-employed people make contributions to the EHIF via an earmarked payroll, social tax', which covers both health and pension contributions (respectively equal to 13% and 20% of wages).

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[24] Detailed description of healthcare financing and expenditure in Estonia can be found in "*Health in Transition. Estonia*" by European Observatory on Health Systems and Policies (*Jesse et al. 2004*)

In recent years the share of state and municipal budget for healthcare has fallen, leading to an overall decline in public expenditure on healthcare. Central government and municipal budget finance has not fallen due to any change in government responsibilities or functions, but allocations to healthcare have not increased at the same rate as overall budget increases. Most of the state budget goes on ambulance services and administration for the uninsured, the state budget funds only emergency care.

In 2003, private sources of healthcare financing accounted for 24.5% of total expenditure on healthcare, rising from 13.2% in 1998. Out-of-pocket payments by households, excluding private health insurance, account for 83.9% of private spending on healthcare. These have grown steadily since the mid 1990s and are mostly spent on pharmaceuticals and dental care. Private health insurance mainly consists of travel insurance.

External sources of healthcare finance play a minor role in Estonia and fell to almost 0% of total healthcare expenditure in 2001. However, levels of external support have risen in recent years, mainly through the EU Structural Funds. For the first period of the programme (2004-2006), healthcare system should receive 25 million euros from the ERDF for hospital planning, building and equipment, and 1.66 million euros for eHealth development.

In 2001, €68 million was spent on social benefits and services (i.e., 1.1% of GDP). About 23% of this was spent on social services and the rest on cash benefits.

Most healthcare resources – about 70% of total expenditure on health – are channelled through the EHIF, which negotiates and contracts with individual providers. This large contracting power of single main purchaser is important aspect about Estonian healthcare system.

As of 2003, every family doctor has a contract with the EHIF or a patient list. The contents of a basic contract are agreed by the EHIF and the Estonian Association of Family Doctors. Family doctors and nurses contracted by the EHIF are paid via [1] a combination of a basic monthly allowance, [2] a capitation fee per registered patient per month, [3] some fees-for-service and [4] additional payments based on distance to the nearest hospital etc. The payment of ambulatory specialist outpatient care and inpatient care providers is based on contracts with the EHIF which are agreed on the basis of the volume and average cost of cases treated in each specialty. Payment is based on service prices approved annually by the Regulation of the Government, which is similar for all outpatient and inpatient providers.

1.5 Recent policy and institutional reforms, policy strategies

The European Union largely influences recent policy strategies and related discussions in Estonia. The most important strategic activity of the EU is related to the adoption of the Lisbon Strategy in 2000 by the heads of states and governments to bring forth a series of reforms economic, social and environmental aspects in the region. The Lisbon Strategy is heavily based on the economic concepts of innovation as the driving force of economic change (and thus to the ideas of Joseph A. Schumpeter) and of the 'learning economy' (see Rodrigues 2003 for the discussion).

However, developments in the health domain have much less been influenced by EU. One obvious reason for this is the principle of subsidiarity, which explicitly leaves most healthcare issues to member states. Direct references to EU targets or policies are not used as a basis in health domain of Estonia. In the context of Lisbon strategy, Estonia is focusing only on sustainable financing of current social health insurance system. Another reason may be attributed to confidence in own policy and decision-making, which has been proven relatively successful when it comes to health system reforms, including the development of eHealth. Thus far, Estonia fares good with planning and implementation, and given few external pressures healthcare issues are mainly addressed through its own national agenda.

Although Estonia's achievements in information society are highly appreciated nationally, major concerns have recently emerged about the slow advances on knowledge-based economy.[25] For instance, main themes of annual conferences of civil servants have been closely related to innovation and economic development.[26] All recent strategies in Estonia highly prioritise innovation. But most of these remain rhetorics with no real action plans that could cause change in current trends (see Kattel and Kalvet 2006). The new research, development and innovation strategy for the period 2007-2013, which was released for public discussion on April 2006, has turned out to be more debated than the *Estonian Information Society Development Strategy 2013* released oat the same time. Thus, it can be argued that the debate on Estonia's knowledge-based economy has overtaken the information society debate. At present, there is no political pressure on information society strategies, plans and actions.

Several important actions have been initiated relating to the planning, use and impact evaluation of the Structural Funds, namely: European Social Fund, European Regional Development Fund, European Agricultural Guidance and Guarantee Fund, and Financial Instrument for Fisheries Guidance. Based on the EU policy cycle, comprehensive sector analysis reports have to be prepared and integrated. This turned out to be a major challenge for the administrative system, leading to several changes in the strategic planning of policies in Estonia (e.g., approval of the government decree [RT I 2005, 67, 522] on strategic development documents and their processing).

The implementation of good governance to achieve more openness, transparency, accountability, and better and more effective delegation of responsibilities has been an objective of recent administrative changes. While there are no explicit policies on OECD's 'Better Regulation' tools (e.g. regulatory impact assessment and consultation), this have been implemented on different scales by various ministries. However, Estonian public administration system has more profound problems to cope with. A recent SIGMA report in 2003 states that 'the Estonian administrative system may be considered to be on the brink of falling apart … due to an Estonian politico-administrative ideology that is inimical to strengthening badly needed coordination and control mechanisms'.[27] As argued by Drechsler (2004: 390): 'The concept of Governance must not obscure that fact, because no good Governance is possible without a well-working government to begin with, the latter being *a conditio sine qua non"*. A related fundamental challenge includes restoration or (re)creation of the positive concept of the state. The limited notion on the concept of the state and the insufficient state identification on the part of citizens leads to serious problems including implementation gap, unattractiveness of the civil service career, the lack of loyalty of the citizens to the government or true respect for legal or administrative decisions' (Drechsler 2000). Estonian administrative reforms are guided by the new public management (NPM) models (while the experience of many countries by now seems to be very critical towards it) aimed to establish rules rather than to achieve results and plan efficient ways of doing so (Randma 2001a: 124). 'The development of Public Administration has been neither rational nor consistent as political will for structural administrative reforms has been deficient' (Randma 2001b: 43).

In health and social care, an inevitable challenge to cope with is the ageing of population. In addition to this, the trend to increased efficiency in healthcare system calls for reduced secondary and tertiary hospital care with increased workload for long-term and primary care. At the broader political level, two main issues have been raised: sustainability of tax-based health insurance system and poor human resources due to low salaries. So far, neither has been addressed by any strategic action.

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[25] References to Estonian poor performance in comparative EU Trend Chart Scoreboard can be found; see http://trendchart.cordis.lu/.

[26] The conference publication of 2004 was entitled 'Knowledge-based state and economy"' and included contributions from key European innovation policy and administration thinkers, including Maria João Rodrigues, Erik S. Reinert, James E. Rauch and Allen Schick.

[27] This SIGMA report is in the end overly alarmist (Drechlser 2004). The crisis situation is neither recognised by Estonian civil servants.

Since the adoption of the Healthcare Organisation Act in 2002, which defines the current form of primary healthcare and active hospital care provider networks, there has been no major changes in healthcare services. Since then, strategies to develop long-term and nursing care, as well as rehabilitation care, have been in the pipeline of the Ministry of Social Affairs with moderate success. Long-Term Care Development Plan 2004-2015 is being implemented through increased funding of long-term care by EHIF since 2004.

Recently, the new government has initiated revision of several policy areas in the health domain. As it envisaged primary healthcare to be more consolidated and integrated with all other health and social services. The Government approved the Hospital Master Plan of 2003 as the corner stone of hospital reform. The plan is being revised as embodied in the main strategic documents comprising the Hospital Master Plan Revision; yet, without a clear goal.

Integration of care *per se* is not explicitly targeted in any of the strategy papers. Estonian Health Information System Strategy has vague targets to improve inter-operability of data exchange between different parties within the health system. There are signs toward convergence of health and social care. and prospects are complicated due to the separate financing mechanisms of these two systems, directing every discussion and strategy-building to bargaining over funding principles. Nevertheless, the *Long-term Care Development Plan 2004-2015* for health system and *Social Welfare Strategy* make several cross-references to each other's services.

II: BUILDING BLOCKS OF E-GOVERNMENT AND E-HEALTH

II.1 Institutional structures, resources and funding for eGovernment and eHealth

II.1.1 Organisational structure for eGovernment co-ordination

Estonia is a rather decentralised country in terms of the organisational structure of ICT co-ordination. The direct development of information systems generally falls under the responsibility of IT managers in ministries, county governments, agencies and inspectorates, and local governments.

Clear responsibility for dealing with information society and eGovernance issues on the *Riigikogu* level is missing. There is, however, the **Constitutional Committee of the *Riigikogu*** (http://www.riigikogu.ee/?id=34658) that has been recently very active in eVoting debates.

The Estonian information society policy is *de facto* developed by the representatives of the public, private and the third sectors in a government committee, the **Estonian Informatics Council** (http://www.riso.ee/et/koordineerimine/IN), which advises the Government of the Republic. Since 2005 the Council has not actually held meetings.

The central co-ordination unit of ICT management is the Department of State Information Systems at the **Ministry of Economic Affairs and Communications** (see Figure 8). Responsibilities of the Ministry of Economic Affairs and Communications (http://www.mkm.ee) include the development and implementation of the national policy and state plans with regard to informatics, telecommunications and the co-ordination of the work of the state information systems. The Ministry's **Department of State Information Systems** (RISO, http://www.riso.ee) is responsible for the coordination of state information systems as well as of the development and implementation of state IT strategies. Despite its small size (i.e., with only eight civil servants as of 2006) it has been a central and influential unit in the elaboration and implementation of these policies. RISO is working in close co-operation with different ICT working groups consisting of representatives of counties, ministries, and other public organisations.

Figure 8. Organisational structure of ICT management in Estonia

Organisational structure of ICT management in Estonia
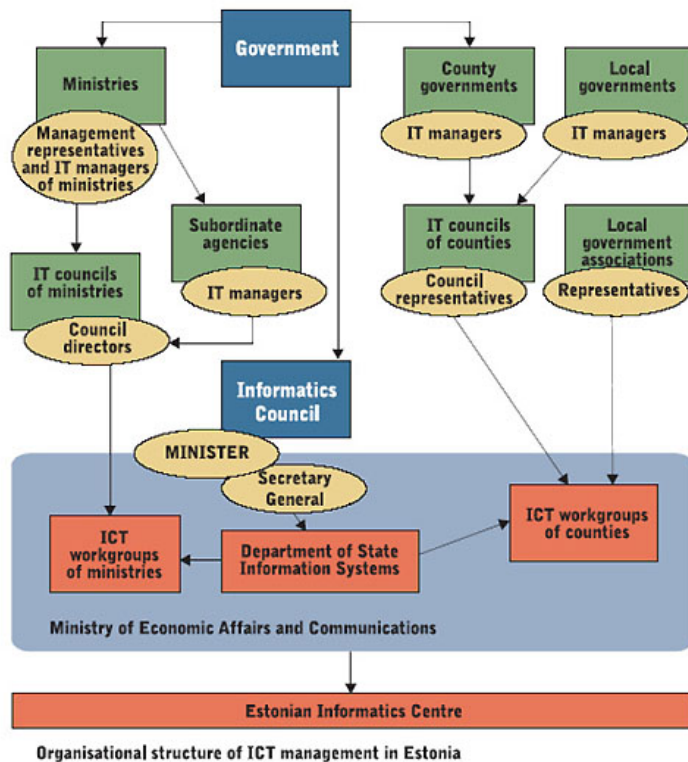
Source: *Developments Related to the Organisational Management of ICT* 2004

The **Estonian Informatics Centre** (http://www.ria.ee) is an implementing body for government-wide information systems dealing with project management, including preparation of strategic IT projects for public institutions and organisation of IT audits in national information systems.

Only a few **local governments** have ICT development units. Tallinn City (http://www.tallinn.ee) is the only one with an ICT Council that advises the City Government on ICT matters. In most local governments, ICT-related issues are addressed by the same specialists employed by the schools or by other public organisations. ICT development plans are generally missing in local governments: only 9% of local governments are reported to have one (*Information Society in Estonian Local Governments*, 2006).

II.1.2   Major organisations providing eGovernment services

The following sections present some key players providing eGovernment services. Although there are other central organisations that significantly influence development, their direct role to eGovernance is much smaller. Nevertheless, these organisations are briefly presented in Chapter 1.3.

1. Ministry of Economic Affairs and Communications

The Ministry of Economic Affairs and Communications primarily deals with strategic planning, priority setting, and financing for such related activities. It is active in the creation of co-operative frameworks and the assurance of their functionality, as well as the drafting of ICT-related legislation and standards. In recent years, the share of international co-operation especially those related to the accession to the EU, has increased in the activities of the central co-ordination body. Further, as questions about the building and maintenance of ICT architecture are becoming strategically important, elaboration of basic framework of inter-operability is also becoming one of the main tasks for the Department of State Information Systems.

Within the area of government of the Ministry are the Communications Board and the Estonian Informatics Centre.

2. Estonian Informatics Centre

The Estonian Informatics Centre is the supporting agency in the development of common information systems in the Estonian administration. It develops, implements and operates the main components of Estonia's national eGovernment infrastructure, including the e-State portal, the middleware system X-Road, the government backbone network EEBone, and the administration system of the state information system.

3. AS Sertifitseerimiskeskus

AS Sertifitseerimiskeskus (Certification Centre Ltd, http://www.sk.ee/) was established in 2001, and as of 2007 it is the only certification authority, providing certificates for authentication and digital signing for Estonian ID Cards.

The company's mission is to ensure the reliability and integrity of the electronic infrastructure behind the Estonian ID Card project and to offer reliable certification and time-stamping services. It also functions as a competence centre for ID Card and spreads the knowledge necessary for creating electronic applications for the card. To this end, *AS Sertifitseerimiskeskus* has created DigiDoc, a universal system for giving, processing and verifying digital signatures. DigiDoc can be connected to any existing or new software, but its components are also stand-alone client program and web portal.

Some functions of registration and auditing of the work of Certification Agencies are also performed by a telecom regulatory agency, the National Communications Board (http://www.sa.ee).

4. State Chancellery

The State Chancellery (http://www.riigikantselei.ee/), a government agency is esponsibile for providing support services to the Government and the Prime Minister. The Department of Information Systems and Document Management ensures regular records management and the archiving of documents in the State Chancellery and manages the development and services of the information systems of the Government of the Republic and the State Chancellery. The Department is a key player in the co-ordination of implementation and use of document management and archiving. The State Chancellery likewise operates an Internet portal called TOM (*Täna Otsustan Mina*, i.e., Today I Decide) (for a detailed description of the service, see II.5.1). Until 2001, the State Chancellery was the key co-ordinating organisation of state information systems development.

5. Executive Agencies, Inspectorates and Local Governments

Executive agencies, inspectorates and local governments are responsible for both traditional ways of provision and online delivery of public services. The largest share of informatics specialists is working in the agencies (see Table 15) including the Tax and Customs Board (http://www.emta.ee).

Table 15. Informatics specialists in central administration

	1998	1999	2000	2001	2002	2003	2004	2005
Agencies	295	295	287	311	319	347	338	345
Ministries	98	101	113	97	135	140	168	176
Country Governments	37	43	35	39	38	39	39	38
Inspectorates	10	27	30	32	31	29	31	32
Support Structures	20	21	26	28	28	28	28	30
Total	460	487	491	507	551	583	604	621

Source: Ministry of Economic Affairs and Communications 2005.

Among the local governments, the city governments of Tallinn and Tartu are the largest and most advanced.

II.1.3   Other actors in eGovernment

1. Academic institutions

Compared to other former Soviet Republics, Estonia has the advantage of having some ICT-manufacturing industry in the country. Almost all former state-owned organisations had their computing centre; and the Tallinn University of Technology and the University of Tartu provided good ICT-education.

The first computers in Estonia were manufactured and installed towards the end of 1950s and at the beginning of the 1960s. The first computer centres were established in the University of Tartu (1959), Institute of Cybernetics (1960), and University of Technology (Tallinn Polytechnic Institute). The first and second generation Soviet-made Ural and Minsk computers were used both in scientific research and IT education at universities.

In the 1980s, specialists from Estonia participated in the development of standard software engineering, and CASE tools, among others, for different ministries of the Soviet Union. For example, the **Institute of Cybernetics,** which was established in 1960 as an institute of the Estonian Academy of Sciences had competencies in elaborating problem-oriented software systems (see also Högselius 2005). Today, the Institute of Cybernetics of Tallinn University of Technology (http://www.ioc.ee/) is an interdisciplinary research institution that specialises in control theory, selected areas of applied mathematics and theoretical mechanics. The Institute also specializes in selected areas of computer science and information technology such as programming language theory, specification and verification of timed and hybrid systems, databases and information systems research. The Institute has also been the engine of nearly all nationwide collaborative initiatives in the field of ICT (see scientific competence of different institutions in Table 16).

Table 16. International publications by Estonian ICT scientists, ISI Web of Science, 1979-2004[28]

Institution	No of scientists	Total no of articles	References	Reference/ articles	Total for institution	Average per person
Cybernetica	13	11	10	0.9	21	1.6
TUT, IC	27	143	268	1.9	411	15.2
TUT	91	149	168	1.1	317	3.5
UT	19	41	778	19.0	819	43.1
UT[124]	18	27	44	1.6	71	3.9
Total[125]	155	326	1,202			

Source: Kattel and Kalvet 2005: 52

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[28]   The international scientific level of the University of Tartu, when measured by the number of publications and references per research employee, is undisputedly higher than that of the others. At the same time, more than 90% of the publications and references concerning the University of Tartu in the ICT field are only from and to one scientist. For this reason, there are also other calculations excluding this specific scientist.

The other important research and development competence centre has been **Cybernetica AS** (http://www.cyber.ee/), established in 1997 as a spin-off of the Institute of Cybernetics. It deals with information security such as communications security products, digital signature technology, development of mission-critical systems and navigation systems development company. They were also involved in the development of the Estonian eVoting software.

2. Banks

The first banks were established in Estonia in 1988. Hansapank started its first electronic banking solution Telehansa in 1993. The first banks to introduce Internet banking services in Estonia were *Eesti Forekspank* and *Eesti Hoiupank* in 1996 (for the history of Internet banking, see Kerem 2003). It is somewhat extraordinary that electronic and Internet banking emerged rapidly in the country. It is even more exceptional that as the world's first Internet banking services started in 1995, and by the end of 1996 there were only about 20 such services, of which three were from Estonia (Charles 2004).

A strong software industry that could develop and service large-scale banking information systems was missing in Estonia in the beginning of the 1990s. This gap had in turn challenged the banks in Estonia to build up their own in-house capacity. As a result, the banks have been the 'informal' leaders in the software industry in Estonia.

The Estonian banking system has been a standard-setter and catalyser of eServices. Today, the banks are authentication mechanisms to access public sector eServices. The banks have also been crucial in establishing public key infrastructure in Estonia.

The *AS Sertifitseerimiskeskus* (Certification Centre) was established in line with the government's plan to subcontract certification provision and time stamping. It was established in co-operation with Hansapank (http://www.hansa.ee/), SEB Eesti Ühispank (http://www.seb.ee/), and two telecom companies – AS Elion (http://www.elion.ee/) and AS EMT (http://www.emt.ee).

> **Box 6. Authentication mechanism provided by banks**
>
> The authentication mechanism provided by banks are considered as trustworthy as those based on the ID card. Most of the public sector eServices (except eVoting) can be accessed through this mechanism.
>
> Take for example if one is to use *hanza.net*. A client has to enter into the bank's website a user ID specified in his/her hanza.net subscription agreement and his/her permanent password consisting of six digits, which is given in a sealed envelope at the time of opening an account . The computer will then request for another password listed in a password card, which contains 36 number combinations. (There are different options available, including code generating calculators). Once a client is logged in to the system, there is a special sub-section called 'eServices' available that redirect, using an encrypted channel.
>
>

3. Other private sector organisations

There are many software companies, which are actively partnering with public institutions in the development of advanced solutions. These companies include Abobase Systems AS (http://www.abs.ee/), Cell Networks Ltd (http://www.cellnetwork.ee/), Datel Ltd (http://www.datel.ee), MicroLink Eesti AS (http://www.microlink.ee/), Real Systems AS (http://www.rs.ee/), AS Regio (http://www.regio.ee/), and AS Webmedia (http://www.webmedia.ee/).

The Estonian Association of Information Technology and Telecommunications (http://www.itl.ee) is the umbrella organisation of the software companies with the objectives to unite the Estonian information technology and telecommunications companies; to promote their co-operation in Estonia's development towards information society; to represent and protect the interests of its member companies; and to express their common positions. This voluntary association focused on the popularisation of ICT, the promotion of vocational education, and the participation in the legislation process to lobby for needed policy amendments on information technology.

The Estonian Information Technology Society (http://www.eits.ee/) is another active private sector organisation. It is a union of professionals.

4. AS Andmevara

AS Andmevara (http://www.andmevara.ee/) is a state-owned IT company which works on hosting and management of some government registries and databases, and maintenance and development of public sector IT systems. AS Andmevara is the authorised processor of the Estonian Population Database.

5. State Audit Office

The objective of the State Audit Office (http://www.riigikontroll.ee/) is to ensure economic, efficient and effective use of funds in the public sector. Based on the audit results, the Office advises public sector institutions on the use of public funds and efficient task performance.

In the field of ICT they have carried out six audits for the period 2001-2006 (for an overview of audit results, see section 8). At present, the audit of the use of ICT in local governments is in progress.

6. eGovernance Academy

The Estonian e-Governance Academy (http://www.ega.ee) was established in 2002 by United Nations Development Program (UNDP), Open Society Institute (OSI) and Estonian Government to train and advise top civil servants, political leaders and stakeholders ion strategic planning and the basics of ICT coordination and information society to increase government efficiency and to improve democratic processes. The main target groups are stakeholders from the former Soviet republics, Southern and Eastern Europe, and Asia.

II.1.4 Organisational structure for eHealth co-ordination

At the moment, eHealth coordination is undergoing remarkable changes in Estonia. The most important factor is the decentralised nature of the Estonian health system, which resulted in the fragmented and uncoordinated development of ICT within the health sector. Today, the development of eHealth is the responsibility of each individual provider, including family physicians and hospitals. Occasionally, the **Ministry of Social Affairs** (MoSA; http://www.sm.ee/eng/pages/index.html) and **Estonian Health Insurance Fund** (EHIF; http://www.haigekassa.ee/eng/) provide small-scale project funding for development projects, but not in a systematic way that follows a strategic plan.

The EHIF and MoSA play a role of indirect coordination by defining few standards that all participants in the field have to follow and sending information in electronic format. EHIF is using its purchasing power to define the criteria in the contracts with the providers on reimbursement claims through data management with service providers or with pharmacies. MoSA issued few regulations regarding the composition and format of statistical information for providers, which are uploaded to the MoSA's server. The integration of these requirements into local information systems of providers is the responsibility of each individual organisation. Thus, all organisations have managed their own eHealth solutions or have used different small vendors in the market. The initial providers have been developing their own systems since the first half of the 1990s. Several attempts to agree on voluntary standards for information exchange have failed, although most providers have been rather supportive to the idea. So far, grassroots-level initiatives do not follow any strategy or governing framework.

Between 1997 and 1998, MoSA developed a hospital information system as freeware to all hospitals. EHIF, at the same time, funded the development of information system for family doctors. The former turned out as a failure, because the licence of the developed software was left to the ministry, which did not properly manage its further development. Based on the initial software, a handful of independent proprietary solutions have evolved. The solution for family doctors was taken up by an independent company, now successfully serving 80% of family doctors in Estonia. Neither of these solutions was oriented towards clinical information management and until very recently, this part of eHealth development remains uncoordinated.

Since 2000, the Ministry of Social Affairs has attempted to take the lead role and steward the eHealth agenda in Estonia. Real steps were taken since 2003 when the National Health Information System project was launched within the Ministry. Prior to this, it was a part of World Bank loan preparation for Estonian Health Project. During the project's first years, a series of feasibility studies were undertaken which forms the basis for the Estonian Digital Health Record Vision document (which became public since November 2004, yet with several amendments thereafter). MoSA also executed a Regulation setting the minimum information for health records in Estonia (see chapter on Legal framework), which is the basis for the development of electronic medical records.

On October 2005, the Ministry of Social Affairs and representative organisations of providers and professionals established a private, not-for-profit **Estonian E-Health Foundation** (EHF; http://www.e-tervis.ee) as the implementing agency for the National Health Information Strategy. The EHF is organised to further outsource main development work through international procurement from private sector, which is believed to enhance efficiency and technological competence. The implementation of the National Health Information System Strategy has not been formally approved by the Government, its implementation can still be considered tentative. Currently, the EHF is dealing with the management of public procurement projects to develop four (4) core components of planned national health information system. These four projects are Digital Health Records, Digital Prescription, Digital Image Archive and Digital Appointment Booking. Other expected responsibilities, -- such as coordination of providers' IS development and acting as a competency centre have yet to materialise.

Figure 9. Tentative management plan for National Health Information System
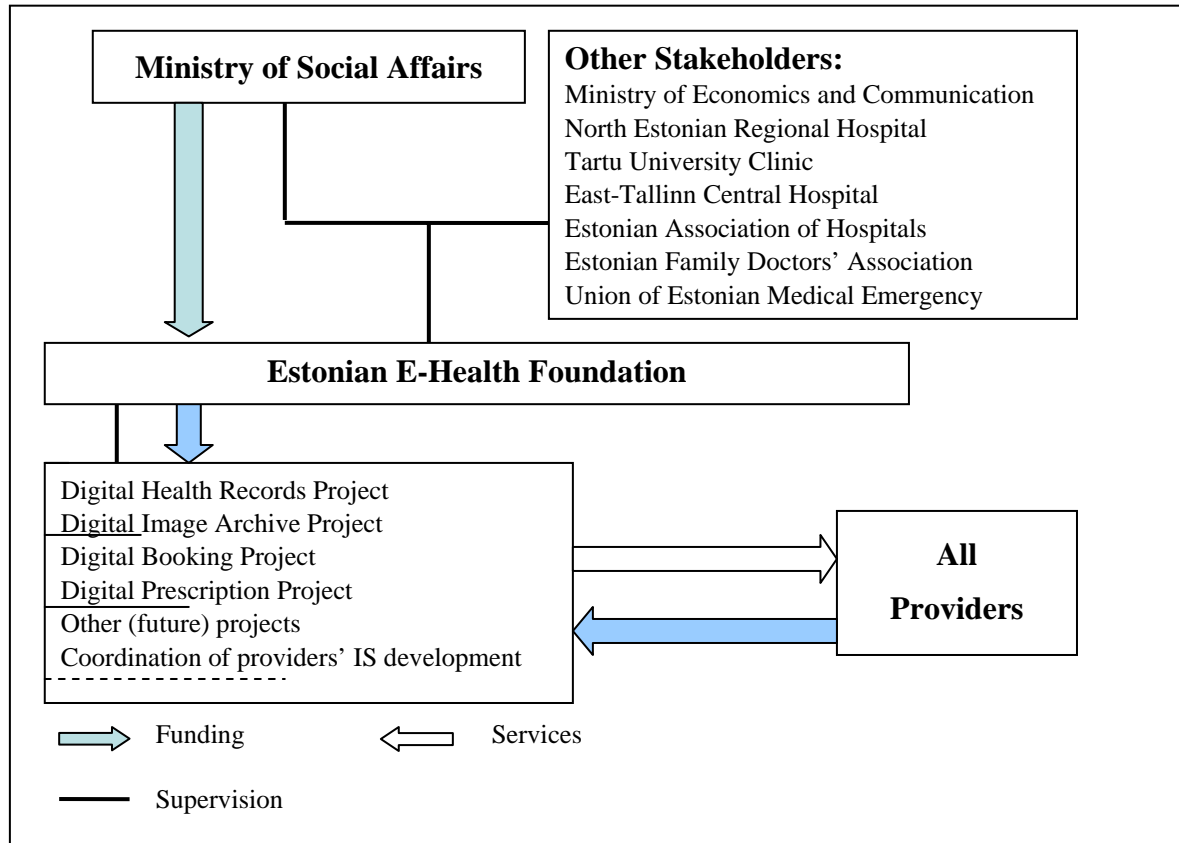
Source: Authors, based on data from Estionan E-Health Foundation

The health sector is highly decentralised in Estonia, giving each player extensive autonomy, including the promotion of more active use of ICT in the provision of services. Hence, one can find eHealth services in almost all levels of the health system. Their development, however, is relatively uneven.

Due to well-developed ICT infrastructure as well as Public Information Law, all public bodies must obtain minimum capability for eServices development including the health system. Therefore, all publicly funded organisations maintain a web page, they also accept electronic information requests (via e-mail or specific web-applications), and digitally signed documents. Interactive web page is available on few occasions. At the state level, EHIF is the most advanced eHealth player that often acts as a standard-building body for other stakeholders through its intensive ICT use in service development.

There are sure front-runners among health service providers, to the extent that some claim to be working paperless by the end of 2006. Yet, it is usually the data processing that lags behind in the development.

Since the beginning of the Internet bubble, private and NGO sector have been offering eServices in the health domain. Most of them are project based and under-funded efforts but a few have grown into sustainable services, usually through financial support from public resources.

II.1.5   Major organisations providing eHealth services

National public authorities

The **Ministry of Social Affairs** has been collecting statistical data from all health service providers online since 2000. A fully integrated version of this service has been available since 2003.

The **Estonian Health Insurance Fund** allows two-way or even full online integrated services to almost all of its partners. Since 2002, health service providers may upload their reimbursement claims electronically and check online patient's insurance status in real time. Employers can also register and manage their employees' insurance status online since 2004. By 2005, family doctors can process temporary work disability allowance since full documentation is available online. In the same year, EHIF launched primary care advice line.

Health service providers

1,212 independent **health service** providers including single person family doctor (FD) or specialist care providers, on the one hand, and large hospitals with more than 800 beds, on the other, are responsible for their own ICT development. The first eHealth solutions appeared in hospitals in the mid-1990s when family doctors advanced quicker with the sophistication of their eHealth solutions. Recently, large hospitals are once again at the forefront of eHealth development in Estonia with more resources increasingly becoming available for ICT.

Tartu University Clinic (TUC; http://www.kliinikum.ee/eng/) started telemedicine projects in 1997, which has today enabled real-time video consultations and clinical conferences with other hospitals and family physicians. This is used for emergency consultation of head trauma patients and weekly specialist consultations to family doctors in Saaremaa, the largest island off the western coast. Since 2001, with the facilitation of the EU-funded Bitnet project, TUC started shifting from film-based diagnostic imaging technology to fully digital images. TUC's digital image archive holds over 25 million units of digital images from different hospitals all over Estonia, forming the *de facto* standard of digital imaging for the country. Since 2001, TUC has also been developing the most sophisticated electronic medical record. So far, the project is still in the development phase with very high expectations despite several drawbacks and rescheduling of deadlines. Based on the plans, TUC's project will be a standard-setting hospital for electronic medical record. A major advancement from the current information system used in hospitals is the orientation to clinical operations instead of financial claims management.

The **East-Tallinn Central Hospital** (http://www.itk.ee/index.php?page=680)is a partner in EU-funded BALTIC E-HEALTH project which has successfully established tele-radiology bridge between hospitals in Estonia, Norway, Denmark, Finland and Lithuania. This project enables through this mechanism, Estonian radiologists interpret digital X-rays from Danish hospitals. It is driven by lower price of Estonian specialists and the limited number of radiologists in Denmark. The project further aims to connect the national networks of Denmark, Sweden and Norway into a regional network in Estonia and Lithuania. If completed, this will be the first cross-border health data network that connects over 200 hospitals and 6,000 general practitioners and family doctors in the Baltic Sea Region.

HTI Laboratories (http://home.hti.ee/)was the first laboratory to offer online sharing of lab results to its partners. This is the largest private biomedical company in Estonia which merged with Quattromed, a spin-off company of the University of Tartu.

Health Centre Medicum (http://www.medicum.ee/index.php?id=297) is another private organisation offering outpatient healthcare services in a polyclinic type setting, purportedly having the most advanced medical information system, including medical health records with online access to patients and on-line appointment booking solution. On-line laboratory services are also offered. The Centre plans to be paperless clinic by 2006.

Services for consumers

The first consumer-oriented health portals were opened in 2000 – www.inimene.ee and www.kliinik.ee. There are several portals/one-stop-shops which provide a range of services such as health information, advice, available services, and other relevant information. The most popular portals are run by private companies and only one goes back to an initiative by the government – the Health Protection Inspectorate.

The **Estonian Sexual Health Association** (http://www.amor.ee/), an NGO, has set up an Internet consultation service for sexual health matters. The service is funded by EHIF since 2003 and has become an acceptable and popular way of getting advice by teenagers and adolescents. Few community groups (e.g., www.beebikool.ee for mothers of babies) have evolved into popular peer-to-peer services and studies on their quality and impact are currently limited.

Public non-central level

Since county governments and local governments have very few active responsibilities regarding health service provision, their role in eServices remains that of mandatory e-linkedness as described above.

II.1.6   Other actors in eHealth service development

eHealth Industry

The eHealth industry is not yet well-developed in Estonia. Historically, most hospitals in the 1990s employed their own in-house ICT development teams. While proprietary software is used, it still requires a lot of local ITcompetence to keep it running and integrated with other business processes. Until today, there is no information system on the market that would offer full solution for an organisation. However, with the increased importance of ICT in health organisations, as well as the consolidation of management information on health and IT market, there is a growing interest in the industry.

There are few PPP examples on the development of eHealth solutions from previous experience. In most of these cases, private capital has developed eHealth solutions (eBooking, ePrescription) and later tried to get formal acceptance by the MoSA. However, MoSA is working towards acquiring full control and coordination of all eHealth development in Estonia. Thus, all these initiatives are awaiting the clearance through public tenders. Successful small-scale PPPs can be found from cooperation of private capital with individual hospitals or professional organisations.

Pharmaceutical Industry

The pharmaceutical industry has funded a few consumer and professional-oriented portals but not in a systematic way. All these initiatives are small-scale and mostly project-based, therefore limiting its significance in promoting electronic information management.

There are also consumer-oriented web pages that are developed by a pharmaceutical companies. No systematic overview of the number, content and users of these web pages is currently available. Yet, 41% of all Internet-users claim they are using Internet to find information on health matters, which raises concern on the quality control system on health information in Internet.

Professional organizations and individual specialists

eHealth development is largely driven by enthusiastic professionals either through their work in professional associations or in their current workplace. This applies for instance, to quick development of eHealth services among groups of family doctors, in which the leader of the association has

initiated several innovations such as Internet-based central information system for FDs and 24/7 hotline for medical advice. Further, the rapid development of teleradiology and digital image technologies is backed by strong support of the society and its leaders.

II.1.7   Financing structure of eGovernment and eHealth

Funding of the IT projects of the central government has been provided directly through the State budget. IT expenditures were thus part of the budgetary allotments of all government institutions listed separately in the state budget. Over the period 1994-2002, the eight-member Committee on IT Expenses was formed under the directive of the Secretary of State (State Chancellery), distributed the central IT expenditures. The Committee was commissioned to select substantiated proposals from various central government institutions. The main part of IT budget was decentralised in such a way that guarantees the attainment of the aims of the information policy. Since 2003, however, the budget allocation for ICT expenditures has been included in the budget of management costs of public organisations.

For the period 1993-2005, Estonia has invested ca EUR 200 Million for the development of government information systems. The share of IT expenditures, excluding personnel-related costs, for the said period has been ca 1% of the total state budget (Figure 10).

Figure 10. Expenditures by central administration on IT per annum, 1993-2005
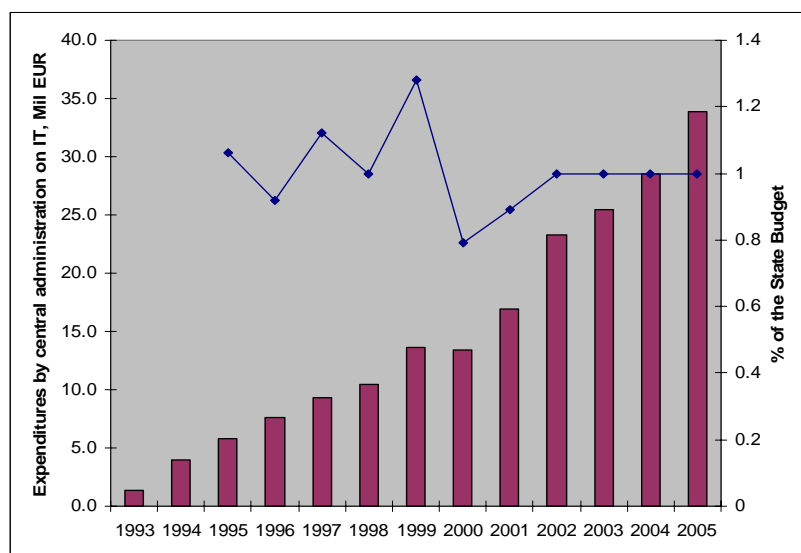
Source: *IT in Public Administration of Estonia*, Yearbooks 1994-2004; Authors' calculations

Local governments have budgetary autonomy and local taxing powers, and hence enjoy a substantial degree of autonomy on ICT-related programmes and projects. A recent study reveals that ICT development costs consisted 0.2% - 6% of the total budget of local governments in 2006 (see *Information Society in Estonian Local Governments*, 2006).

The programmed contribution of EU funds to information society development over the period 2004-2006 amounts to more than EUR 8.32 million, of which 25% are to be provided by the state (*Use of EU Structural Funds...*, 2005). This fund covers less than 10% of ICT development and maintenance needs of the central government. The other 90% of the needed costs are to be covered from state budget.

The 'Estonian National Development Plan for the Implementation of EU Structural Funds – Single Programming Document 2004-2006' outlines four priorities related to Infrastructure and Local Development as outlined in the supports information society developments. The priority areas are related to further development of eCitizen portal, guaranteeing inter-operability of State registers,

provision of public key infrastructure (PKI) and digital signatures to offer secure services, and the development of content services (eGovernment, eHealth, eLearning, eInclusion and eTrust).[29] The preliminary version of the Estonian Information Society Development Plan for 2013 indicates priority 4.1 for eGovernment development with a funding allocation of EUR 22 million for the achievement of its goals.

Small share of funding has also been provided by other donors such as the IST programme of FP6 (with 10 projects funded as of 2005),[30] eContent (six projects) and *e*TEN (3 projects), although only a few of these contributions are directly related to eGovernment and eHealth (*Participation in EU Programmes*... 2005).

EHealth development programmes are mostly funded from the operational costs of each organisation. So far, the use of EU funds - mainly PHARE Transition Facility projects during the accession period - has been relatively modest. In this respect, MoSA has taken steps and first contracts have been signed for the development of National Health Information System with the support of the EU structural funds. More funds than the current have been applied for the next programming period of the EU Structural Funds. There are also cases when individual providers have participated in international EU-funded R&D projects, thereby contributing to the development of eHealth solutions. Recently, there have been few examples of private venture capital involvement in the development of eHealth services in PPP format. Whether or not these have been successful requires further examination.

EHIF has been a major driver for the development of eHealth services due to its own large investments in ICT. On the average, EHIF spends EUR 800,000 annually on ICT (excluding IT personnel), comprising 14% of its total administrative costs (see Figure 11.). 29% of total ICT costs are spent on development.

Figure 11. EHIF spending on ICT 2003-2005
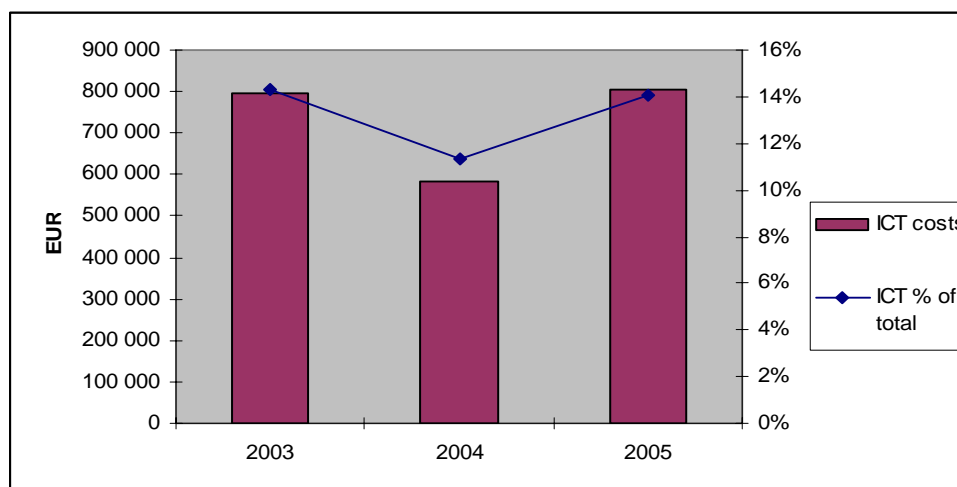
Source: Estonian Health Insurance Fund 2005

Health service providers regard ICT like any other costs for service provision and is included in the price EHIF pays to providers. Principally, local governments can contribute to investment of hospitals, but currently, only the capital Tallinn has been able to do this. Healthcare providers spent an average of 0.85% of their total costs on ICT (excluding personnel), up from 0.7% in 2003 (see Figure 12). The biggest spenders were primary care physicians (i.e., family doctors) who spent 1.5% and 1.8% of total

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[29]   See the Minister's Decree on the distribution of Funds, at
       http://www.riso.ee/et/?q=finantseerimine/struktuuritoetus/SF_maarus.
[30]   For an analysis of Estonian participation in the Fifth RTD Framework Programme (FP5), see *Estonian Participation in the European Union*…, 2002; also, for overview of sub-field user-friendly information society, see Pihl 2003.

costs on ICT in 2003 and 2004, respectively. On the average, 16% of this amount was spent on software and 33% on services such as telecommunications and development work. However, some providers still hire large in-house development teams, which in some cases raise the total ICT costs (including all IT-personnel) to 4% of the total budget.

Family doctors are largely funded on a capitation basis. But their financing model includes additional block grant for capital investments and other administrative costs including ICT, which enabled family doctors to invest relatively more in ICT (see also Figure 12). However, family doctors have a very low purchasing power - about, on the average, EUR 700 annually per physician, which impedes their capacity to invest in ICT. The cost efficiency of ICT in their budget remains questionable because majority of family doctors practise individually. This situation has improved due to the increasing number of group practices and new models of software leasing.

Figure 12. ICT costs of Estonian healthcare providers, 2003-2004
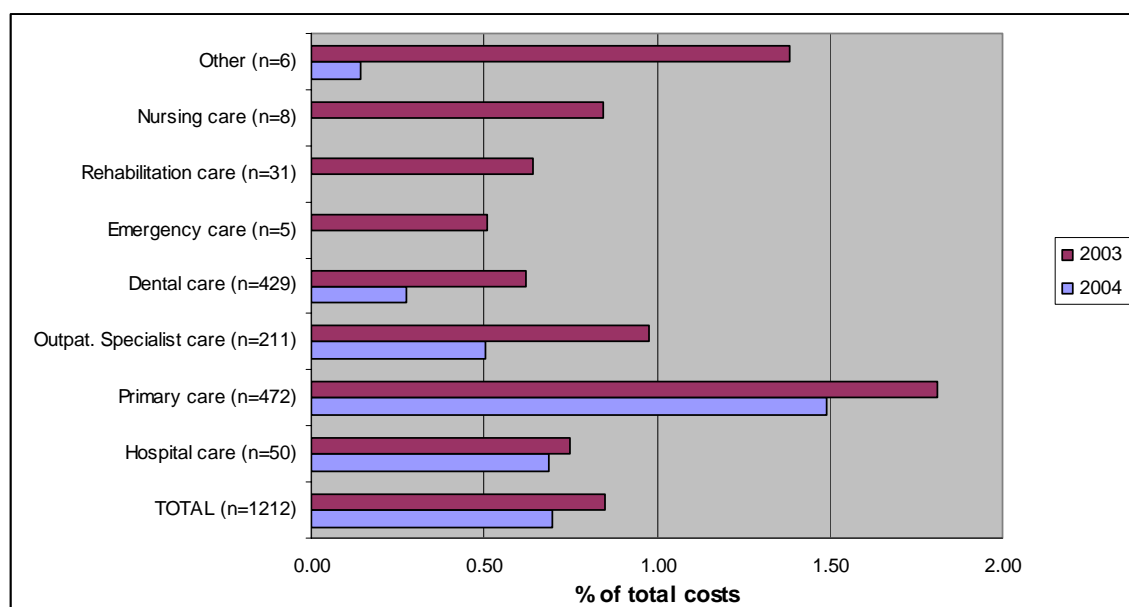
Source: Ministry of Social Affairs 2006. Authors' calculations

During the accession period in the health sector, only a few ICT-projects were funded from EU sources such as PHARE[31] and the Transition Facility. The Ministry of Social Affairs attempted to develop a universal electronic medical record for hospitals, but was unsuccessful. However, Gennet Lab, Ltd. started its cooperation with MoSA and developed its own electronic medical record solution. This company is currently the leading EMR seller in Estonia. MoSA is relying on the ERDF to finance the first phase of the National Health Information System development with a co-financing the budget EUR 2.2 million for the period 2006-2008 for the new programming period. This amount is reportedly 'much bigger' than the previous.

Very little information is available regarding the other types of foreign aid used for the ICT projects in the health sector. The Open Society Institute supported the development of first health-related websites within the non-governmental sector.

Private investment has not played significant role in the development of eHealth services until recently. At the height of Internet portals in the early 2000s several consumer oriented health websites were established (i.e., four within a year). At the moment there is no commercially successful or extremely popular among Estonians. There is a limited number of consumer-oriented services which

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[31] The Phare programme was one of the three pre-accession instruments financed by the European Union to assist the applicant countries of Central and Eastern Europe in their preparations for joining the European Union.

charge directly from users (e.g., online consultation). Recently, venture capital has shown some more interest in eHealth such as the development of central Internet-based information system for family doctors. Further, the trend from the last few years suggests that pharmaceutical companies have actively started sponsoring, or even directly developing, disease-related information websites for consumers.

II.1.8 Distribution of expenditures in eGovernment and eHealth projects

For the period 1995-2005 the average share of IT expenditures (excluding personnel-related costs) was 1.0% of the State budget. An annual budget of around EUR 30-35 million, including contributions from the EU Funds, have been allotted for central government organisations. The share of expenditures on developmental projects vis-à-vis IT-infrastructure has been almost equal. In 2003, for example, IT infrastructure costs amounted to EUR 14.2 million while the cost of development projects amounted to EUR 11.8 million (State Audit Office 2005: 27).

The most costly developmental projects in 2005 were the Digital Health Record (EUR 1.6 million) and Family Registry (EUR 1.6 million), both of the Ministry of Social Affairs. Both projects have started, but not finished and the money was not disbursed by the end of 2006.

A more detailed picture of public sector expenditures is unavailable because the budget for ICT expenditures is included in the budget of management costs of public organisations since 2003. There are no available data at regional and local levels.

On the average, hospitals in Estonia spend 0.85% (0.2% - 1%) and primary care providers 1.8% from their total budget for ICT. This includes both investments in technology and, with a lesser amount, to development work. Sixteen percent (16%) of this amount is spent on software and 33% on services such as telecommunications and development work – and the rest is for hardware purchase and maintenance.

In the early 2000s, MoSA financed the Estonian Health Project, which conducted several background and feasibility studies to prepare the National Health Information System. The project was funded from a World Bank grant as well as from the central government budget. In 2004, MoSA applied for EUR 1.66 million from the ERDF to finance the first phase of the National Health Information System project. MoSA is co-financing the projects with EUR 0.55 million, increasing the total budget to EUR 2.2 million for the period 2006-2008. For the new programming period the amount applied for is reportedly 'much bigger' than the previous. The exact figure has yet to be disclosed.

Table 17. Planned costs of the National Health Information System (in EUR)

Project Title	TOTAL Budget	ERDF financing	National Co-financing	Planned duration
Digital Health Record	1 594 941	1 196 206	398 735	36 Mo
Digital Waiting List Registration System	193 530	145 147	48 382	12 Mo
Digital Prescription	237 731	178 298	59 433	12 Mo
Digital Images	190 073	142 555	47 518	10.5 Mo
TOTAL for EHIS from 2004-6 period	**2 216 274**	**1 662 206**	**554 069**	

Source: Ministry of Economic Affairs 2006

Individual expenditure on eHealth services has not been studied. Nevertheless, it can be seen that it is only marginal because only 6% of Internet users have bought something on Internet in 2005 (TNS

Emor 2005) and the number of services is not substantially big. Indeed, it is prohibited in Estonia to deliver medicines purchased over the Internet.

II.2 Current strategies, policies, action plans and projects

II.2.1 Strategies, policies, action plans and projects in eGovernment

Attempts to build up an information society as well as knowledge-based economy in Estonia can be traced way back in Estonian politics and policy. The first information society strategy – *The Estonian Way to the Information Society* – was prepared in 1994. The document was much inspired by respective developments in the EU (Bangemann Report and White Paper on Growth, Competitiveness, and Employment - the Challenges and Ways Forward Into the 21st Century) and of the USA (Information Infrastructure Task Force, 1994) and focused largely on market failures associated with infrastructure development (Kalvet 1997).

The main policy document on Estonian information society policy – *Principles of Estonian Information Policy* (RTI 1998, 47, 700) – was approved by the Parliament in 1998. The following were seen as main instruments: modernisation of legislation, supporting the development of the private sector, development of interaction between the state and citizens, and awareness raising on problems concerning the information society. An important link between policies and action plans was also established since then. On the basis of the Principles, an Information Policy Action Plan, which is updated annually was developed where all Government agencies made specific proposals with schedules, sources of finance, and responsibilities for implementation of information policy. Such Action Plans were approved by the Government in 1998.

An updated version of the strategy – *Principles of the Estonian Information Policy 2004-2006* – was approved by the Government in 2004. It reiterated the priority given to the development of eGovernment services, stressing the main objectives including; the introduction of eServices in all state agencies together with respective training and awareness-raising activities for the whole society; keeping the level of ICT use in Estonia at no less than the average level of the EU, and hence ensuring the efficiency of the Estonian economy and society in general; and increasing the export capacity of the IT sector. Other key elements of the 2004-2006 strategy include provisions for: the developing IT solutions for extending e-democracy; increasing efficiency of the public sector; increasing digital literacy through e-learning; increasing ICT-related research and development to promote private sector activities; establishing a national IT security centre as a contact point for all EU institutions; enhancing the reputation of Estonia as an e-State; and facilitating access to ICT for the socially disadvantaged. In main principles, the documents are rather similar, although the recent is more concrete than the later ones in terms of targets and instruments and it connects information society with education, R&D, culture, business, etc. Likewise, the position on the role of state in information society has become clearer all over the world. EU policy developments such as *eEurope and eEurope+* have also been considered.

The new *Estonian Information Society Development Plan 2013* sets out objectives covering social, economic and institutional dimensions. It acknowledges that no additional disparities or divides are to be created in developing an information society, and that an information society should enable the reduction of current gaps.

Under the social pillar, the development plan aims to ensure that every member of society could live a full life, using the possibilities of information society and actively participating in public life. Ensuring that all people would have access to the necessary preconditions for participating in the information society requires, on the one hand, access to digital information via different technological channels and, on the other hand, skills and motivation to use the developed solutions and to actively participate in decision-making processes. By widening access to digital information it is meant to achieve a situation, where: high quality Internet access will be available all over Estonia; all consumers will be able to use similar services irrespectively of technological solutions used for their provision; and all

public sector websites will be accessible to people with special needs (i.e., in accordance with the WAI principles[32]).

Another aspect of the social pillar aims to increase possibilities for participation. This includes the achievement of the situation where: everybody will have at least a basic computer and Internet skills; awareness will be raised about the possibilities and dangers, including security and intellectual property, related to the information society; real mechanisms and tools will be developed for increased participation in decision-making processes; eLearning will be used for improving the existing skills and acquiring new competences primarily for in-service or re-training as well as traditional learning processes; and information of scientific, artistic, technological, social value, will be digitised and made accessible to citizens.

Under the economic pillar, the *Information Society Development Plan* aims to contribute to the continuous growth of the Estonian economy as a result of wide support to ICT. Augmenting the technology-intensiveness of the Estonian economy requires that enterprises will utilize ICT to increase their productivity and competitiveness and help business models to be attuned with new technological possibilities. Furthermore, this requires that the added value generated by the Estonian IT sector will be higher and the sector's export capacity will be stronger.

Under the institutional pillar, the development plan seeks to ensure that public sector will be citizen-centred, transparent and efficient. It presumes that state and local government business procedures will be efficient, simple and transparent and, that a common service space will be used for the provision of services for citizens and businesses as well as for more efficient communication between public bodies. In increasing the efficiency of public administration in accordance with ICT possibilities, the most important objectives are the following: all management of public business will be electronic; the state information system will be service-based and function based on user needs, not according to departmental division; the electronic personal identification mechanisms used in Estonia will correspond to the best practice in the world and will be usable both in Estonia and at the international level. Another set of actions to increase the efficiency of public services are: a secure service space will be developed for citizens, allowing them to use public services and communicate, in the same environment, both with the state, businesses and other citizens; eServices with highest impact on the efficiency of public administration and economy will be identified and developed. Awareness-raising activities will be carried out and, if necessary, these services will be made obligatory for legal persons; and possibilities of using Estonian eServices will be developed for citizens of other EU member states.

Estonia has implemented several e-solutions in the public sphere, although at times, it is difficult to understand if these projects resulted from approved policies and action plans, or would have emerged anyway and, as such, these policies have been adopted *post factum*. A very pragmatic approach can be observed in Estonian eGovernment development. It has been more 'development-driven strategies' than 'strategy-driven development'. While there has been a general consensus by all political parties on the goal to transform Estonia into a successful information society, linkages between political rhetoric and policies/action plans sometimes remain weak. Some central information systems and applications have been developed by technocrats without existence of respective policies (e.g., establishment of state portals was to a large extent financed by NGO Open Estonia Foundation), or they have taken place in NGO sector (e.g., full and publicly available on-line database of Estonian legislative acts, official forms on the Internet) in earlier days (and later taken over by the public sector). Today administrative procedures are much more established and rigid, and in the case of other technologies (e.g., Public Key Infrastructure and ID card) and applications (e.g., eVoting) heightened political debates have taken place.

In reality, information society and eGovernment policies are neither discussed nor implemented in synergy with other policies (e.g., regional policy, local administration reform, enterprise support, etc), but recently, signs of change are emerging. This is due to the whole logic of the planning in the use of

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[32] Web Accessibility Initiative, see http://www.w3.org/WAI/.

EU Structural Funds. These linkages need to be much better considered. For instance, in one of the recent draft policy papers – *Estonian Information Society Development Plan 2010* – linkages between eGovernment, procurement, innovation, and economic development are combined synergistically. Perhaps some of the few exceptions are developments related to good governance, which considers the potential of ICT and leads to results in several eServices very early.

There are some key IT-infrastructure projects which are the bases for Estonian eGovernment today (for more details, see Section), namely: *PeaTee* (EEBone), *KülaTee* (Village Road), Data Exchange Layer X-Road and the Public Key Infrastructure and electronic ID (ID-cards).

II.2.2 Major eHealth policies and evolution in time

At the central government level, eHealth initiative has been expressed mainly in rhetorics until very recently. The National Health Information System concept has been in all versions of the MoSA strategy since 2000 when it was first introduced as part of the Estonian Health Project 2015. In recent years, eHealth is also separately mentioned among other eGovernance priorities in national level strategy documents, including in the *Principles of Estonian Information Policy 2004-2006*.

It seems that with the decentralisation of healthcare service all operational responsibilities (including ICT development) were fully laid on individual providers but without strategic guidance. Indeed, data collection has been requested electronically by MoSA since 2003. Thus, one can say that the Health Insurance Fund has acted as a lighthouse for the providers and motivated them through its contracting policy to develop sophisticated ICT tools for financial management and data sharing.

Currently, Estonia is on the verge of dramatic change in eHealth development where national government through the Ministry of Social Affairs would play a major role. The Ministry of Social Affairs is planning to facilitate the implementation of the strategy through the coordinated development of standards, financial support for adaptation and linking of existing information systems, and massive training. Indirect motivation methods are active PR-campaign and legal incentives to promote the uptake.

Currently, the only specific policy document for eHealth is the draft of Estonian Health Information System Development Plan 2005-2008. It was compiled and introduced to the Government in December 2004, yet there has been no official approval of the document. Part of the reason is general change in the process of developing national policy and strategy papers. Currently, the policy document is not in active processing. However, one of the strategic goals of MoSA states that 'digital health record will be implemented' not indicating the specific date or evaluation criteria.

The above mentioned strategy is a compendium of several analyses from MoSA researches conducted between 2002 and 2004. These are ethical and legal feasibility studies, business plans, risk analyses as well as organisational and general feasibility analyses. All these describe several challenges expected to be addressed within the implementation.

In 2004, the Prime Minister's office compiled an ambitious plan, Eesti Edu 2014 (*Estonian Success 2014,*), for the successful development of Estonia within the next 10 years. The document states several strategic goals to be achieved by 2014 including eGovernance and public eServices as priority development areas. MoSA refers to this document in their strategic planning.

Since there is no general policy document on eHealth approved it is only possible to follow the development process using working documents of the Government. The coalition agreement is a set of policy measures agreed upon whenever a new government is formed. Even though this agreement has no legal basis, it is the main strategic document that guides the action of the coalition including financial allocations from central government's budget. Current coalition agreement has been in force since April 2005 and states among others that the Government's goal is to bring more transparency into healthcare cost data for improved benchmarking and monitoring, which is achieved using

eGovernment solutions, among others. A new legal framework for NHIS implementation was developed under the same strategic goal by November 2006. Previous coalition Government's agreements (April 2003, April 2005) did not mention eHealth as a specific priority, but declared that 'ICT projects will be continuously funded in the area of public governance to enable more effective and cheaper services to citizens.'

EU documents, such as the Lisbon Strategy and eEurope Action Plan, have indirect influence on eHealth policy making in Estonia, even though they are not explicitly referred to in any policy document or working paper. In addition, while the participation of Estonian civil servants in the working groups is relatively active, national working groups find little interest in developing position statements on EU policies, rather than working on actual implementation process of the National Health Information System.

The most influential policies on eHealth development are those that lay the foundation to general healthcare reform in Estonia during the last 15 years. First, the two waves of decentralisation of healthcare provision in 1994 and 2002 and development of strong central Estonian Health Insurance Fund in 2001. This defined the strong autonomy of all providers regardless of their size and responsibility in all aspects of their functions. Further, it defined the leading role of EHIF in the setting rules through active purchasing and negotiations with providers. For eHealth development it meant that unless government has significant parallel eGovernance programme with sufficient fund, it would not be able to guide or promote the process.

The failure to strengthen local governments in reducing their number also meant that they cannot financially support providers in their ownership. Only a few big local governments have been able to channel the funds from selling old hospital buildings to the development of respective hospitals. Through this policy, hospitals, which are in better financial situation, were able to invest more into ICT development.

In 2006, EHIF initiated first steps in introducing payment for performance to providers. Initially, family doctors are expected to report their success on monitoring certain prevention and chronic disease. This brings out the need for sophisticated information systems, which support these activities. Majority of family doctors do not have suitable electronic health records in use.

II.2.3   Major projects accomplished and currently under preparation in eHealth

The **Estonian Health Insurance Fund** (EHIF) is the largest eHealth services supplier in Estonia. Each year EHIF spends around EUR 240,000 (or 14% of its annual operational budget) on ICT development work. Main services available are described below.

Online handling of financial reimbursement claims from providers and pharmacies started in 2001 and became fully operational since 2002. All transactions are handled on-line. According to EHIF estimates, the number of mistakes in invoices fell (http://www.haigekassa.ee/raviasutusele/toru).

Insurance status registration and management for employers started in 2003. The responsibility to notify about new employees to register for health insurance can be done using automated online application. This system was used by 70% of employers in 2004 (http://www.haigekassa.ee/tooandjale/edastamine/e_leping, *In Estonian*). Temporary work inability form can be sent electronically, which is a prerequisite for EHIF to pay the allowance to the employee (http://www.haigekassa.ee/tooandjale/toovoimetusleht/tvh/, *In Estonian*).

Insured persons can use eCitizen portal (http://x-tee.riik.ee/portaal/) in order to use following services offered by EHIF:
  – check one's insurance status
  – check the temporary work inability allowance request status

- apply for EU health insurance card
- apply and process the additional reimbursement for drug costs.

The **Ministry of Social Affairs (MoSA)** has been processing mandatory statistical data reporting from providers using Internet since 2000 (http://213.184.49.169/aveeb/, *In Estonian*). This is a good example of a relatively well-functioning front-office, where all mandatory forms can be uploaded using automated application with logical control triggers. However, the back-office solution to aggregate and analyze the individual reports from providers has not been developed to the same level of sophistication.

Between 1997 and 1998, MoSA financed the development of **hospital information system** (Ester) using financial support from PHARE. The project did not succeed due to several problems including technological and project management concerns. Later on, the development of the software was continued by a private company, which has been on long legal negotiations over the intellectual property of the software. Currently the company is leading EMR vendor in Estonia.

At the end of 2005, MoSA launched the **National Health Information System** (NHIS) development. The main purpose of NHIS is to develop nationwide framework (database) that would facilitate the exchange and diffusion of health information. Currently, these are only available in local databases and information systems, which are not often communicated. Further the NHIS to shift health information system from institution-centred to patient-centred. The goal is targets the functional implementation of NHIS within three years, i.e., by the end of 2008.

It is foreseen that the NHIS will contain information on every encounter of an individual with the healthcare system in a lifetime. The primary rationale is to centrally manage database of critical health information about individuals and a register of links to other encounters, which will contain detailed information that can be diffused in the information systems of respective providers, pharmacies etc.

The main components of the National Health Information System are:
- Digital Health Record (containing critical information about all individuals in Estonia);
- digital appointment booking system;
- digital prescription system;
- digital medical image database;
- digital blood-bank database;
- national health registries;
- national medical informatics' standards.

From **providers** the most noteworthy projects are:
- the first full-featured hospital information system with digital medical record and digital image databank by Tartu University Clinic (estimated investment costs over EUR 300,000, for the development period 2003-2006).
- tele-consultation between Tartu University clinic specialists and family doctors in Saaremaa island and specialists in small rural hospitals.
- telemedicine project Baltic E-Health where radiologists in East-Tallinn Central Hospital consult digital images in Danish hospitals via Internet-connection.
- Internet-based central health record for use in primary healthcare services (www.tervisepank.ee) (estimated investment costs over EUR 300 000 for the development period 2003-2005).
- Internet-based central appointment booking system (www.doktor.ee).

II.3   The legal framework supporting eGovernment and eHealth applications

Estonia has been often reported as a country with favourable legislative environment towards ICT and the most important legislative acts have been approved without external pressure (e.g. compliance to *acquis*). There is a law guaranteeing electronic access to public information (including draft legislation). For instance, the Estonian ID-card is a compulsory identity document for all citizens, making it possible to use digital signatures. Furthermore, the Estonian Parliament Electoral Law legislates the use of eVoting at the national level. Estonia is the only country in the European Union with an eVoting law for national elections actually in place.

Although there is currently no specific eGovernment law in Estonia, the most important aspects are covered in the following legislative acts:
–   Public Information Act (RT I 2000, 92, 597),
–   Local Government Organisation Act (RT1 I 1993, 37, 558),
–   Digital Signatures Act (RT I 2000, 26, 150),
–   Estonian Parliament Electoral Law (RT I 2002, 57, 355)
–   Personal Data Protection Act (RT I 2003, 26, 158),
–   The Information Society Services Act (RT I 2004, 29, 191),
–   Electronic Communications Act (RT I 2004, 87, 593),
–   Public Procurement Act (RT I 2001, 40, 224),
–   Databases Act (RT I 1997, 28, 423) ,
–   The Identity Documents Act (RT1 I 1999, 25, 365).

The most important of them and their direct relevance to the provision of eGovernment services are analysed in this section. Detailed descriptions of all relevant acts are available from *eGovernment in Estonia, 2005*.

The **Public Information Act** took effect in January 2001. The Act covers state and local agencies, legal persons in public law and private entities conducting public duties, including educational, healthcare, social or other public services. Some important principles of transparent governance are established (e.g., a request for information from a government office must be responded within five working days). The Act also includes significant provisions on electronic access and disclosure (e.g., the duty to maintain websites, obligation to ensure that the information is not 'outdated, inaccurate or misleading', e-mail requests must be treated as official requests for information, etc.). Information disclosed through the website is very extensive, including statutes, job descriptions, reports on work results, management reports, formats of petitions and other documents and instructions for the completion. Most importantly, it will also include draft acts and regulations together with explanatory memoranda, draft concepts, development plans, programmes and other projects of general importance before such drafts are presented for approval (for the full list, see Annex 3). It covers the provisions of the EU Directive 2003/98/EC of 17 November 2003 on the re-use of public sector information.

The **Local Government Organisation Act** contains the principles of local government and gives the residents of a rural municipality or city the right to participate in the exercise of local governance and prescribes transparency of activities. It also includes disclosure of legislation and minutes of both council sessions as well as local government sessions.

Approved on 8 March 2000, the **Digital Signatures Act** came into force on 15 December 2000, provides the necessary conditions for using digital signatures and the procedure for supervision of certification services and time-stamping services. Digital signature has the same legal consequences as a hand-written signature. In relation to private law, digital signatures shall be used according to agreement between the parties, but State and local government agencies, legal persons in public law, and persons in private law performing public law functions, are required to provide access on

information concerning the possibilities and procedures in using digital signatures in communication with such agencies and persons through the public data communication network. The Identity Documents Act establishes and regulates the identity document requirement for Estonian citizens and to foreigners living in Estonia.

According to the **Parliament Electoral Law**, voters who hold a digital signatures certificate can vote on the website of the National Electoral Committee but only on advance polling days - from the sixth to fourth day before the actual election day.

Other legislative acts have been approved or amended[33] following the EU requirements including the Information Society Services Act to implement EU Directive 2000/31/EC on certain legal aspects of information society services such as electronic commerce; and the Electronic Communications Act to implement the new EU Regulatory Framework for Electronic Communications.

In the **health domain** the legal framework has relied on horizontal laws as described above. In some cases brief amendments into existing acts have been introduced so that they further facilitate the development of eHealth applications to an extent (e.g., Healthcare Services Organisation Act and Health Insurance Act). The legal foundation for all national health registries is laid down in the Public Health Act of 1995 and Communicable Disease Act of 2003. Regulations based on these laws do not yet define the specific electronic transmission of notifications. This is, however, the standard for new registries in the framework of National Health Information System.

There are few examples of secondary law that deals specifically with information in health domain. Under the provision of the regulation of the Minister of Social Affairs (Nr 76; May 6, 2002) on the list and format of the documents for healthcare service provision, the use of digital documents in healthcare is approved granting that they fulfil all the requirements of the regulation. Following the regulation of the Minister of Social Affairs (Nr 116; November 29, 2001) on the requirements for family physician's office premises and equipment, each family physician is require to to have a computer, printer and Internet connection.

However, several experts have proposed a new legal framework (working name 'Digital Health Information Act') for health information that would facilitate the implementation of National Health Information System and related eHealth projects. This proposed law is now being prepared and is expected to reach the parliament in 2007.

II.4   The dedicated specific ICT infrastructure

II.4.1   Computer workplaces and Internet in public administration

The development of the public sector ICT infrastructure started early in Estonia and has been successful. Most of the civil servants have access to computers for their daily activities. For instance, 34.8 % of the administrative staff of central apparatuses are equipped with computers in 1995 (*Information Technology Means in Public Administration Agencies...*), 89% of computer needs were satisfied in 1998; and as of 2005 the corresponding figure has reached 97% (see Table 18).

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[33]   Examples include Personal Data Protection Act, the first version of which was passed by Parliament in 1996, was amended in a major way in 2003 and 2004 to be made fully compliant with the EU Data Protection legislation).

Table 18. Computer workplaces[34] and civil servants in public administration organisations

	1998	1999	2000	2001	2002	2003	2004	2005
Civil servants in the Estonian central administration	26 588	28 232	23 951	21 772	25 478	24 314	23 708	24 033
Estimated need of computer workplaces	11 538	14 396	15 608	17 578	18 048	18 225	18 563	19 183
Actual number of computer workplaces	10 220	12 559	13 978	15 505	17 042	18 000	18 200	18 650
Internet-connected workplaces		11 342	13 151	13 645	15 884	16 960	18 100	18 400
Needs for computer workplaces covered (%)	88.6	87.2	89.6	88.2	94.4	98.8	98.0	97.2
Internet-connected workplaces (%)		90.3	94.1	88.0	93.2	94.2	99.5	98.7

Source: Ministry of Economic Affairs and Communications 2005.

As of 2005, 99% of the computers of central government organisations are connected (mostly via broadband) to the Internet (see Table 18). According to the survey *Information Society in Estonian Local Governments* on 2006,[35] the situation regarding both hardware and software in local governments is relatively good. The study reveals that all local civil servants who need computers have access to such equipment and are all connected to the Internet.[36]

The advanced situation regarding Internet connections in public organisations is mostly a result of some successfully implemented targeted projects:

– The backbone network *PeaTee* (EEBone) is the broadband network of data communications between government institutions, or Internet for government institutions. It is a public network in which every state and local government agency has the right, rather than obligation, to use it. The development of *PeaTee* was based on the backbone network ASONet elaborated by the Border Guard Administration, the Customs Board and the Police Board in 1993. The use of the backbone network is financed centrally from the state budget and the use is free of charge for subscribed clients. Currently, it connects all county centres (see Figure 13). There are more than 21,000 computers connected to the *PeaTee* network and more than 1,300 governmental and local institutions are using it (Estonian Informatics Center, 2006). *PeaTee* is administered by the Infrastructure Department of the Estonian Informatics Centre.

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[34] A computer workplace is to be interpreted as the possibility for an employee to individually use a computer at his/her desk. The computer can be either an autonomous personal computer or one connected to a local area network (LAN), or a terminal connected with a minicomputer.

[35] Out of 227 municipalities and cities surveyed, 115 local governments responded to survey questionnaire.

[36] Broadband connections are also available in all local governments, although in reality some seem to be experiencing problems in operating wireless networks.

Figure 13. Backbone network **PeaTee** *(EEBone)*
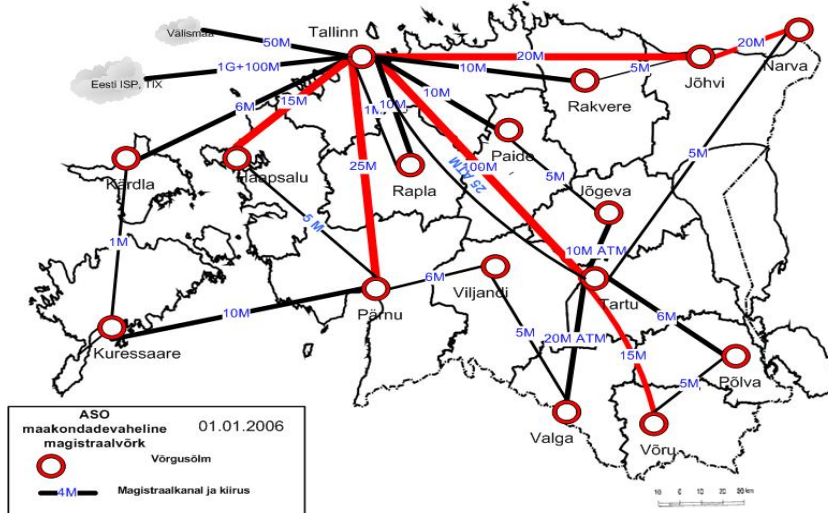
Source: https://www.aso.ee/et/files/ASO_2006_jaanuar_magkanalid_1.jpg

- As a follow-up project to *PeaTee*, a target programme *KülaTee* (Village Road) was carried out between 1999 and 2001 and *Külatee 2* in 2002-2004. These programmes aim to provide data communication services for local government agencies, schools and libraries. In the programme framework, the, infrastructure was built in rural areas to provide the above-mentioned institutions with data communication and permanent Internet connections. Local government agencies were switched to PeaTee network nodes; and schools, libraries and other cultural institutions were connected to the EENet or commercial ISP-s (*Development of Data Communication Infrastructure…* 2004). *KülaTee 3* is currently being developed; it aims to build broadband connections to the municipalities with a special focus on regions where there are market failure. The idea is to support infrastructure development in these regions by offering broadband connection at a reasonable cost.

- The Estonian Educational and Research Network (EENet) is a governmental, non-profit organization established in August 1993 by the Ministry of Education with the task of managing, coordinating and developing the computer network of science, education and culture. Since 1997 EENet operates as a state agency administered by the Estonian Ministry of Education and Research. In 1993 the whole network consisted of less than two hundred computers in Tartu and Tallinn. In the early part of 2005, the number of end-users of Estonian academic network was approximately 228 000 people including researchers, students, teachers and pupils among others. The network extends to most counties in Estonia (EENet, 2006).

- The State Infocommunication Foundation (RIKS), a non-profit organisation, which was established by joining several national service providers at the end of 2000, provides state and local government agencies with operational radio communications, maritime communications, and telephone and data communications services.

Consequently, technical background for providing eGovernment services is excellent in Estonia. In addition, good bases for the development of eServices in Estonia have been made possible through the following co-ordinated steps: [a] IT Architecture and Interoperability Framework, [b] Data Exchange Layer X-Road, and [c] Public Key Infrastructure and ID Card.

II.4.2 IT architecture and interoperability framework

The State Inter-operability Framework and the related documents[37] describe the integration of public sector information systems into a single logical whole (*Information Technology in Public Administration of Estonia*, 2006, pp 11-25). This is elaborated at the initiative of the Ministry of Economic Affairs and Communications and involved IT experts representing the central and the local government agencies as well as organisations from the third and the private sectors,

Compliance to the IT Architecture and Interoperability Framework is obligatory in the public sector, but concrete results remain to be seen.

Box 7. IT Architecture and Interoperability Framework

Key principles of the state IT interoperability are as follows
- the institution-based approach should be replaced by service-centred one;
- public services (including nested services) are provided free of charge for public sector institutions;
- the development of information systems is based on Internet-centred approach;
- XML-based technologies are used for the integration of information systems and the presentation of data;
- information systems provide and use services via a data exchange layer based on multilateral agreements;
- course will be taken towards wider use of open standards;
- in developing information systems, open source based solutions are considered alongside proprietary ones;
- access to public services should preferably be ensured via a web browser by different channels and devices;
- all services requiring user authentication and authorization exploit the secure middleware X-Road for data transport;
- the authentication and authorization procedures of civil servants are based on the use of the Estonian ID card;
- as a temporary alternative, authentication mechanisms of Internet banks can be used for citizen authentication;
- central and local government agencies co-operate in order to ensure the provision of information and services for citizens, officials or entrepreneurs from one place, without need to know anything about the subordinating system of the executive power or the division of roles therein.

Source: (*Estonian IT Interoperability Framework, 2006, p. 5*)

II.4.3 Data exchange layer X-Road[38]

The architecture of eGovernment in Estonia was developed in the framework of the X-Road project. X-Road is the implementation of unified interfaces for different databases and a data exchange layer which allows officials as well as legal and natural citizens to search data from national databases over the Internet within the limits of their authority. The system ensures sufficient security for the treatment of inquiries made to databases and responses received (*Developments Related to the Creation...* 2005).

The project was initially launched to link the Estonian state databases with the common data resource accessible over the Internet. After the successful start of sending database queries and answers over the Internet, the X-Road environment was expanded to send all kinds of electronic documents in XML-format securely over the Internet. Furthermore, X-Road became the skeleton for all eGovernment services.

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[37] The main document is the *Estonian IT Interoperability Framework*; related documents are *Estonian IT Architecture* and *Estonian Semantic Interoperability Framework* – all available (in Estonian), at http://www.riso.ee/eng/koosvoime.

[38] This section is based on *Information Technology in Public Administration of Estonia...*, 2006, pp 28-31.

The general architecture of the eGovernment is outlined in Figure 14. The main backbone of the eGovernment environment is the X-Road network of distributed and central servers.

The essence of the eGovernment is that different information systems communicate with each other via security servers (SS), which are built up as special firewalls storing all the messages (queries, services) in logs. This means that after a long period, it would still be possible to restore previous information such as service users, time period as well as what kind of decisions have been made in a particular context.

Figure 14. eGovernment architecture in Estonia
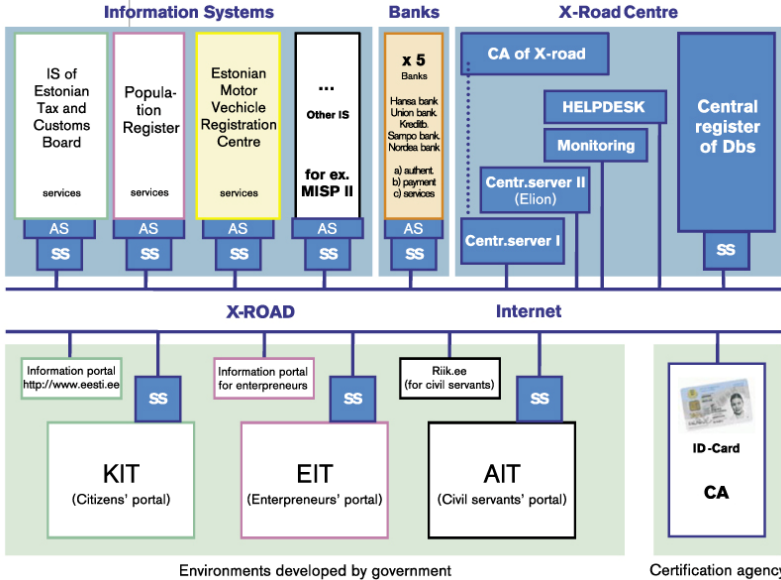
Source: *Information Technology in Public Administration of Estonia...* 2006, p. 30.

In the eGovernment environment, information systems provide and also consume services. The Estonian commercial banks particularly Hansapank, SEB Eesti Ühispank, Sampo Pank, Krediidipank and Nordea Pank are playing three different roles in the eGovernment schema. First, they provide portals, which are connected to the eGovernment environment, with the authentication service for citizens. This is because all Estonian citizens do not possess the ID card yet, but more than half of the population already has contracts with commercial banks for using Internet banking facilities. The authentication mechanism provided by banks is considered as trustworthy similar to that based on the ID card and considered to be valid in using eGovernment services.

Second, some of the services are paid for and, therefore, a system has been developed for paying these charges. Citizens transfer money to the bank after which the e-service will automatically start.

Third, the banks themselves are data users and eServices and are using this environment just like any other information system.

Figure 14 shows that every information system is connected to the X-Road security servers via adapter servers (AS). Adapter servers are converters for translating X-Road messages in XML format to special database query language (mainly SQL) and from query answers back to XML.

The X-Road centre is actually the heart of the eGovernment environment as all central servers of the whole network are connected and located in that centre. The centre employs special staff for managing eGovernment hardware, software, Internet connections, agreements, etc.

II.4.4 Public key infrastructure and ID card[39]

Central to Estonian eServices are the opportunities provided for electronic authentication and authorization through the Estonian ID card. Without the existence of this infrastructure several innovative public services in Estonia such as eVoting would not be possible.

Estonia started issuing national ID cards in January 2002. The card fulfils the requirements of Estonia's Digital Signatures Act and is mandatory for all Estonian citizens and permanent resident foreigners over 15 years of age. It is meant to be the primary document for identifying citizens and residents and its functions are to be used in any form of business, governmental or private communications. Issued by the Citizenship and Migration Board, the card is valid for 10 years as an identification and travel document (within the EU).

In addition to being a physical identification document, the card has advanced electronic functions facilitating secure authentication and legally binding digital signature for public and private online services. An electronic processor chip (a respective smart card reader is needed for operation) contains a personal data file as well as a certificate for authentication (along with a permanent e-mail address Forename.Surname@eesti.ee for e-communications with the public sector) and a certificate for digital signature. The data file is valid for so long as the identity card remains valid.

> **Box 8. ID card use**
>
> In order to use the Estonian ID card for authentication and digital signatures, one needs an Estonian ID card with valid certificates and PIN-codes. Computer used for voting must have a smart card reader,[40] a driver for ID card (free to download) that is available for a Windows or Linux operating system.[41]
>
> The primary application available for free for all ID card holders is a secure signing portal DigiDoc (https://digidoc.sk.ee/). In addition to the portal technology, the DigiDoc Client has been developed, enabling to check the signing and signatures in the user's computer. Signed documents can be sent by e-mail and uploaded to a document management system (*Estonian Public Key Infrastructure, ID Card and Digital Signature*, 2005).
>
>

The digital certificates are valid for 3 years and can be renewed for free, but not for longer than the period of validity of the identity card. In addition to the national ID card, Estonian residents can also use their Internet banking identification data to access online public services.

As of October 2006, there were 1 003 113 ID cards issued in Estonia (the whole population is 1.4 million) (Sertifitseerimiskeskus, 2006).

> **Box 9. Initiative 'Computer Protection 2009'**
>
> As Estonia aims to become the country with the most secure information society, in May 2006 leaders of the largest banks (SEB Eesti Ühispank, Hansapank) and telecom operators (Elion, EMT) as well as the Ministry of Economic Affairs and Communications signed a co-operation agreement to launch a nationwide initiative to increase end-user PC protection and awareness in Estonia.
>
> A number of sub-projects will be launched (funded by these companies in the amount of EUR 3.7 million), the priority fields being the promotion of ID card-based authentication in the use of eServices.

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[39] This section is based from *eGovernment in Estonia*, 2005.
[40] For the list of compatible readers, see http://www.id.ee/pages.php/03030101,416.
[41] For further details, see a White Paper available at http://www.id.ee/file.php?id=122.

II.5 Services provided

II.5.1 eGovernment services

In terms of online public services available, Estonia is considered advanced and highly sophisticated.[42] The country is not only ahead of all other New Member States, but also scores better than the majority of EU-15 countries including France, Germany and the Netherlands (see Figure 15). For instance, more than 60% of Estonia's online services are fully automated, compared to EU-25 average of 40%.

Figure 15. Online sophistication of public services, October 2004
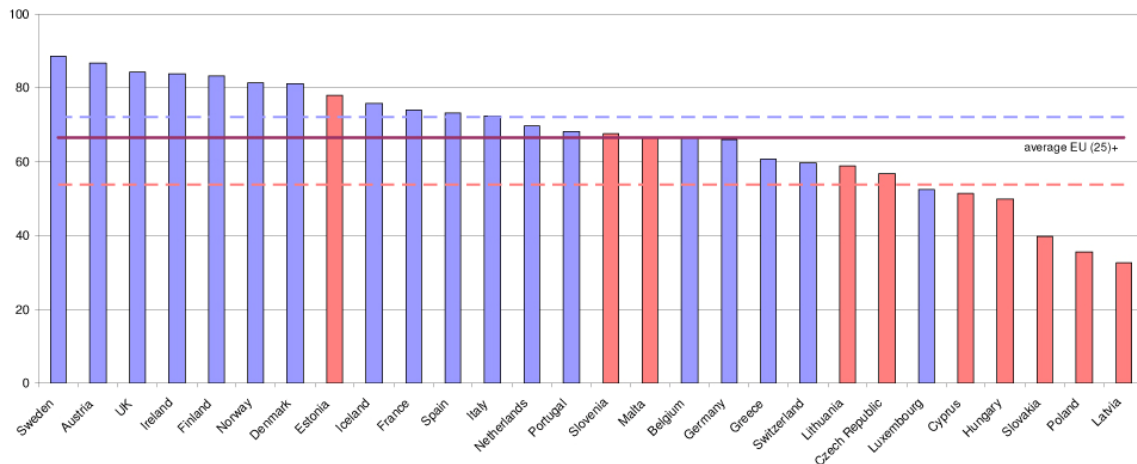
Source: *Online Availability of Public Services...*, 2005, p. 26

Figure 16. Public services fully available online (%), October 2004
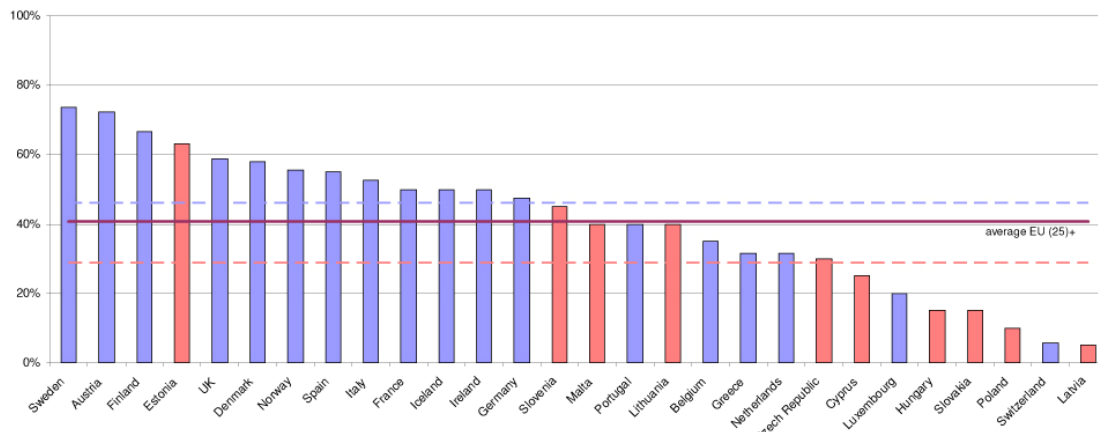
Source: *Online Availability of Public Services...*, 2005, p. 26.

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[42] The selection of public services analysed in the current chapter is based from the document *Common list of basic public services* (2001), which provides the list of 20 basic public services (i.e., 12 for citizens and eight for businesses) agreed upon by the European Commission in order to benchmark eGovernment progress in the EU Member States.
A four-stage framework is applied according to *eGovernment indicators for benchmarking eEurope* to measure the level of online sophistication of the services: (1) Information: online info about public services; (2) Interaction: downloading of forms; (3) Two-way interaction: processing of forms, incl. authentication; and (4) Transaction: case handling; decision and delivery (payment).

To facilitate more efficient transaction and navigation, an one-stop shop system, with the following central portals, was established:

- The **State Portal** (http://www.riik.ee) is the main point of entry for information on governance in Estonia. It was opened in 1998.
- The **Information Portal** (http://www.eesti.ee/) provides practical information about the rights and obligations of people living in Estonia. It also offers access to forms, references to legal acts, and useful web pages related to rights and obligations of Estonian citizens, etc. As such, the portal has also been called the citizen's handbook. The service was launched in 2003.
- The **Citizen Portal** (https://www.eesti.ee/) provides the holders of ID card or Internet bank clients access to restricted or confidential information requiring user authentication. Through the citizen portal, citizens can access their personal information system and use the following features: a) citizen's document management system; b) electronic mailbox that can be redirected, and c) a secure environment for accessing services and giving digital signatures. This service was also launched in 2003.

Almost all public services in Estonia already include an eService component. For instance, a digital signature has the same legal consequences in Estonia as handwritten signatures; and all State and local government agencies, legal persons in public law, and persons in private law performing public law functions have to accept digitally signed documents. Since 2002, digital signatures have been used more than a million times for various purposes (i.e., signing of contracts, applications, transaction orders, etc.) (Sertifitseerimiskeskus, 2006).

eServices in Estonia are built based on the Internet platform. Hence, they are all basically pan-European as they can be accessed from and used in anywhere in Europe. Some of the most important services such as the State Portal and Information Portal are already available in English and Russian.

Several other eServices have been developed in Estonia in order to encourage wider involvement in governance and to improve information dissemination, consultation and participation. In particular, two major systems were developed: First, the Internet portal *Täna Otsustan Mina* or TOM (i.e., 'Today I Decide', https://www.eesti.ee/tom/) was opened by the Government in 2001 with the objective to increase participation of people in state decision-making processes. This portal supports a website through which citizens can communicate ideas, suggestions, opinions and offer feedback on any public policy or political issue. In approximately 5% of the cases, the views of citizens have been influential in amending bills. Second, the legislative forum Themis (www.lc.ee/themis/), operated by the Estonian Law Center Foundation, is designed to involve stakeholders in the legislation process. However, neither one is very popular and a number of interest groups and NGOs prefer other channels, as most find it difficult to follow complicated legal websites. In a study conducted by Lepa et al. in 2004, the e-mail was found to be the most preferred communication channel (see Figure 17).

Figure 17. Communication channels used by ministries, according to interest groups, 2004
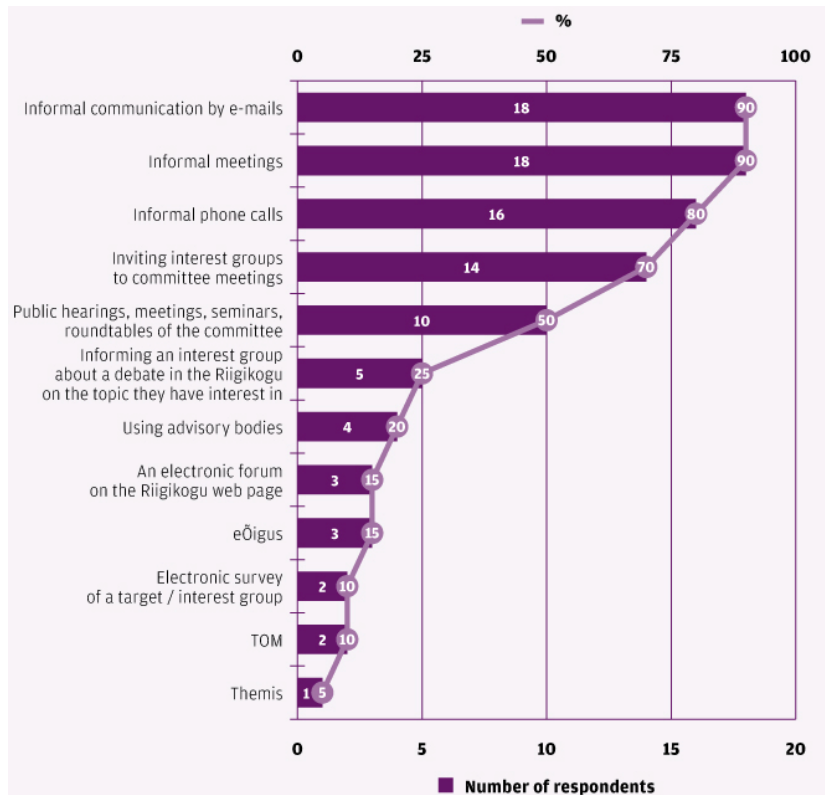
Source: Lepa et al. 2004, p. 118.

Apart from establishment of information and discussion portals, Estonia has also utilized its sophisticated eService system on key state activities. A major achievement was the conduct of the local elections in 16 October 2005 whereby citizens nationwide voted online, making Estonia the first country in the world to successfully undertake an election electronically. This was made possible through the ID-card based system that allowed citizens to sign their ballots electronically via the Internet. The number of e-votes cast during the local elections amounted to 9 287, representing 1.85% of total votes (for overview, see *The National Election Committee*, 2006).

Other services that are used actively include the declaring/filing of taxes (82% of tax declarations) and checking of state examinations results. While other services, such as the information portal of the eCitizen had only 312 000 visits in 2005 (http://admin.eesti.ee/stat/).

BEGIX *(Balanced E-Government Index,* www.begix.net*)* is a self-evaluation tool for eGovernment service. The mapping among local governments in Estonia (based on 59 respondents), showed varying levels of development among local governments. Two extreme cases can be observed in Harjumaa and Pärnumaa which showed good standing and in Valgamaa and Viljandimaa which require more improvement. According to local governments, ICT contributes a great deal to effectiveness and transparency, while other important dimensions such as benefits, participation, and change management are not so well considered (Table 19).

Table 19. Balanced eGovernment index in local governments, scale 1 (no) – 5 (yes)

	Benefits	Efficiency	Participation	Transparancy	Change Management
Harju	3.0	3.8	3.3	3.6	3.1
Ida-Viru	3.3	3.8	3.0	3.5	3.1
Jõgeva	1.8	2.6	2.0	2.2	1.8
Järva	2.3	2.7	1.9	3.0	1.9
Lääne	2.3	3.7	2.6	3.7	3.4
Lääne-Viru	2.5	3.6	2.7	2.9	2.5
Põlva	3.5	3.7	3.6	3.7	3.7
Pärnu	2.5	3.2	3.0	3.4	2.7
Rapla	2.6	3.6	3.1	3.4	2.8
Saare	2.5	3.1	2.6	2.9	2.5
Tartu	2.7	3.0	2.8	3.3	2.9
Valga	1.9	2.9	2.3	2.7	1.5
Viljandi	2.1	2.8	2.1	2.6	2.3
Võru	2.9	3.3	2.2	3.6	2.8

Source: *Information Society in Estonian Local Governments*, 2006.

II.5.2 eHealth services

MoSA and EHIF have developed eServices with varying sophistication for almost all standard transactions for their partners. MoSA has been processing mandatory statistical data reporting from providers using the Internet since 2000 while EHIF has been processing all reimbursement claims from providers and pharmacies electronically since 2002. Through the system developed by EHIF, employers can register and manage their employees' insurance status online since 2003, and insurance status of all individuals can be checked online by providers or the clients since 2000. The State eService portal facilitates the following online eHealth services for individuals:

- − checking one's insurance status
- − checking temporary work inability allowance request status
- − applying for EU health insurance card
- − applying for and processing of additional reimbursement for drug costs (3% of all Internet users have used this opportunity).

In 2005, EHIF launched a central/nationwide primary care hotline to reduce the workload of emergency services – an example of conventional methods used in an innovative way.

Over the years, consumers have increasingly utilized eHealth services. Based on population surveys in 2005, out of all Internet users 41% (28% of those who have used health services within 1 year) have searched for medical information and 7% have used it for booking appointment to a doctor. Other services used by consumers include e-mail communication with doctor, and online requests for additional compensation for drug costs, EU health insurance card, and family allowance child benefit (see Table 20).

Table 20. Use of health and social eServices by consumers, 2005

Searching for medical information	41%
Booking appointment to doctor's admission	7%
Communicating and consulting with doctor using e-mail	4%
Applying for supplemental drug cost reimbursement from EHIF	3%
Applying for EU health insurance card	3%
Applying for family or parent social allowance	2%
Requesting prescription	1%

Source: *Turu-uuringute AS uuring "Avalike e-teenuste kasutamine"*, http://www.riso.ee/et/files/E-teenuste_kasutamine.xls.pdf (updated on 16.06.2005)

EHIF electronic services particularly the online application for managing health insurance registration for employees has been used by 70% of employers

In late 2005, the MoSA launched the National Health Information System (NHIS) development. The project is still in development phase and the first service – on-line appointment booking - is expected to be operational in 2007.

II.5.3   Overview of major eServices to household sector and citizens[43]

This and the succeeding section present a detailed description of electronic availability of most important (12+8) services in Estonia. Out of the 20 most important public services, 13 can be said to be fully transactional. This is likewise the case for 7 out of 8 business sector oriented services.[44] Services offered by the central government (especially by the Tax and Customs Board) are the most advanced ones while those provided by local governments remain mostly on the provision of online information and forms, although local governments also vary in the levels and types of services offered.

1. For the household sector/citizens: Income tax declaration	
Responsibility level:	Central Government
Responsible organisation:	Tax and Customs Board
Website:	http://www.emta.ee/
Sophistication stage[45]:	4/4
Description:	The e-TaxBoard (e-Maksuamet) enables taxpayers to file, view and correct their income tax returns online. It also allows taxpayers to view their VAT returns, submit VAT refund applications, calculate social tax and view tax account balances. Estonian citizens can use their electronic ID cards in accessing e-TaxBoard. This service is widely used, for instance in 2005, 82% of income tax declarations were submitted over the Internet.

> *Box 10. Electronically submitted tax declarations*
>
> Estonia is one of the leading countries in the world when it comes to the popularity of submitting tax returns and customs declarations electronically.
>
> A total of 502,000 income tax returns were submitted to the tax authority by private individuals in 2005; 82% of these came in through the electronic Tax Board system, compared to 76% in 2004 and 59% in 2003.

---

[43]   This section is mainly based on *eGovernment in Estonia, IDABC eGovernment Observatory*, 2005; modified and updated by authors.

[44]   Elaboration of eServices related to new company registration requires legislative changes.

[45]   For explanation, see footnote 32.

2. For the household sector/citizens: Job searches by labour offices	
Responsibility level:	Central Government
Responsible organisation:	Estonian Labour Market Board
Website:	http://www.amet.ee/
Sophistication stage:	3/3
Description:	Displays current job offers at national and regional labour offices in Estonia, which includes short job descriptions, deadlines for application and contact information. As of 12 May 2006, 1 796 vacancies have been announced and 209 job hunters have registered.

3. Social security contributions	
Responsibility level:	Central Government
Responsible organisation: Website: Sophistication stage:	a. Family allowances (Social Insurance Board; http://www.eesti.ee/); 4/4. b. Reimbursement or direct settlement of medical costs (Estonian Health Insurance Fund; http://www.eesti.ee/); 4/4. c. Provision of student grants (Ministry of Education and Research; although banks are providing them directly); 4/4. d. Unemployment benefits (Estonian Unemployment Insurance Fund; http://www.tootukassa.ee/); 2/4.
Description:	For family allowances, applications can be submitted online, while information already known to the State is automatically encoded in the forms. Information on validity of health insurance, name of family physician, and payment of sickness benefits. Services by banks in providing student loans are very advanced, although some paperwork might be needed in some cases. Information on unemployment benefits as well as related forms are available for download.

4. For the household sector/citizens: Personal documents	
Responsibility level:	Central Government
Responsible organisation: Website: Sophistication stage:	a. Passports (Citizenship and Migration Board; http://www.mig.ee/); 3/3. b. Driving Licenses (Estonian Motor Vehicle Registration Centre; http://www.ark.ee/); 1/3.
Description:	Information and forms related to passports are available for download; documents can be submitted by post or electronically, although when applying for the first time one has to show up in person at regional branches of the Citizenship and Migration Board. On driver's license information is available online, however applications must be submitted in person at the Estonian Motor Vehicle Registration Centre. Some procedures (e.g. notice of theft of the licence) can be done via digitally signed forms.

5. For the household sector/citizens: Car registration	
Responsibility level:	Central Government
Responsible organisation:	Estonian Motor Vehicle Registration Centre
Website:	http://www.ark.ee/
Sophistication stage:	2/4
Description:	Information and forms are available for download, but car registration applications must be submitted in person at the Estonian Motor Vehicle Registration Centre. Some procedures (e.g. temporary deletion of the car from the Registry) can be done via digitally signed forms.

6. For the household sector/citizens: Application for building permission	
Responsibility level:	Local Government
Responsible organisation:	Local governments all over Estonia (227)
Sophistication stage:	2/4
Description:	Planning permission applications are handled by local authorities and must be submitted in person. Generally used forms are available for download from the Building Registry (http://www.ehr.ee/v12.aspx?loc=0104).

7. For the household sector/citizens: Declaration to the police	
Responsibility level:	Central Government
Responsible organisation:	Estonian Police
Website:	http://www.pol.ee/
Sophistication stage:	2/3
Description:	A crime reporting form is available on the website which can be submitted using digitally signed forms.

8. For the household sector/citizens: Public libraries	
Responsibility level:	Central Government (and Local Governments)
Responsible organisation:	National Library of Estonia and Local Libraries
Website:	http://helios.nlib.ee/
Sophistication stage:	3/3
Description:	Online catalogue and reservation facility for central libraries.

9. For the household sector/citizens: Certificates (birth, marriage) request and delivery	
Responsibility level:	Local Government
Responsible organisation:	Local governments all over Estonia (227)
Sophistication stage:	0-1/3

10. For the household sector/citizens: Enrolment in higher education	
Responsibility level:	Central Government
Responsible organisation:	Ministry of Education and higher education institutions
Website:	https://www.sais.ee/
Sophistication stage:	4/4
Description:	A central enrolment information system called SAIS (*SissAstumise InfoSüsteem*) has been developed for participating universities to consolidate the whole enrolment information, process and decision-making in one site. The system uses national ID-card as authentication tool aside from bank authentication.

Box 11. Electronically submitted university applications

Since 2006 Estonian school graduates are able to apply to universities online by using the new Common Admissions Information Portal (SAIS) or the Citizens' portal.

Candidates need only submit information directly relevant to their university application as the state register automatically provides the applicants' educational history and grades.

Thus far, a dozen of universities have joined SAIS, including Audentes University, the Estonian Business School, the Estonian National Defence College and Tallinn University. The system was established within the framework of the Tiger University Programme, under the supervision of the Estonian Information Technology Foundation with the assistance of the EU's Structural Funds.

11. For the household sector/citizens: Announcement of moving	
Responsibility level:	Central Government and Local Government
Responsible organisation:	Estonian Population Register and local governments
Website:	http://w3.andmevara.ee/andmek/el1.pdf
Sophistication stage:	2/3
Description:	Forms for announcing a change of address can be downloaded (and submitted to local governments by confirming the documents by digital signature) from local government websites or the Population Register's website.

12. For the household sector/citizens: Health-related services	
Responsibility level:	Central Government and Local Government
Responsible organisation:	Estonian Population Register and local governments
Website:	http://www.medicum.ee/index.php?id=299 http://www.kliinikum.ee/clinic/index.php?menu=97&mod=doctor_reg&lang=est http://www.doktor.ee https://www.bronn.ee/tervis
Sophistication stage:	4/4
Description:	Contrary to the IDABC report that the service is not relevant for Estonia, individuals can book appointments with doctors and find the service useful. This service has been developed independently by several providers and 7% of Internet users have used this option.

II.5.4 Overview of major eServices to business sector[46]

1. For the business sector: Social contribution for employees, corporation tax (declaration, notification), VAT (declaration, notification)	
Responsibility level:	Central Government
Responsible organisation:	Tax and Customs Board
Website:	http://www.emta.ee/
Sophistication stage:	4/4
Description:	Social tax can be filed and paid online using the e-TaxBoard (e-Maksuamet). The system enables the business sectors to file, view, correct corporate tax returns, view VAT returns, and submit VAT refund applications, to calculate their social tax and view their tax account balances.
2. For the business sector: Registration of a new company	
Responsibility level:	Central Government
Responsible organisation:	Centre of Registers
Website:	http://www.eer.ee/
Sophistication stage:	1/4
Description:	Online registration is not possible as several documents (e.g. application to the Register, Foundation Agreement) need to be duly notarised. So far, there is no interconnected system between the Notaries and Centre of Registers.

3. For the business sector: Submission of data to the Statistical Office	
Responsibility level:	Central Government
Responsible organisation:	Statistical Office of Estonia
Website:	http://www.stat.ee/
Sophistication stage:	3/3
Description:	Data can be submitted electronically to the Statistical Office.

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[46] This section is mainly based on *eGovernment in Estonia, IDABC eGovernment Observatory*, 2005; modified and updated by authors.

4. For the business sector: Custom declaration	
Responsibility level:	Central Government
Responsible organisation:	Tax and Customs Board
Website:	http://www.emta.ee/
Sophistication stage:	4/4
Description:	e-Customs application enables online filing of customs declarations.

5. For the business sector: Environment-related permits	
Responsibility level:	Central Government
Responsible organisation:	Ministry of the Environment, Estonian Environment Information Centre
Website:	http://klis.envir.ee/
Sophistication stage:	4/4
Description:	Fully transactional service.

6. For the business sector: Public procurement	
Responsibility level:	Central Government
Responsible organisation:	Public Procurement Office
Website:	http://register.rha.gov.ee/
Sophistication stage:	4/4
Description:	The Public Procurement State Register is an e-tenders portal where all public procurement notices are published electronically.

II.5.5 eServices by local governments

With the annual publication of the *ICT Development in Public Administration of Estonia,* the country's state information system can be considered as well-mapped. However, for a long time developments in local governments have been rather understudied until the release of the *Information Society in Estonian Local Governments* in 2006 by the Estonian eGovernance Academy. The report takes a closer look at the sophistication of eServices offered by local governments. Based on the 4-stage model applied and presented above the following main conclusions can be drawn.

At first, majority (97%) of local governments have websites; most of them (80%) are regularly updated, although only a fifth is available in multiple languages. Basic information (statutes, development plans, budget, information on civil servants and their salaries, etc.) is mostly available on websites (see Table 21), as well as information on Councils and Governments (members, contacts, information on commissions, legal acts).

Table 21. Content of web-sites of local governments

County	Number of local govts	With website	Updated regularly	Multiple languages	Information on civil servants	Salaries
Harju	18	18	18	9	18	12
Hiiu	4	4	4	0	4	3
Ida-Viru	16	15	8	4	14	7
Jõgeva	10	10	8	1	10	8
Järva	11	11	11	1	11	11
Lääne	11	11	11	1	11	8
Lääne-Viru	13	13	8	4	13	11
Põlva	13	13	12	2	13	7
Pärnu	19	18	12	1	18	12
Rapla	10	10	10	1	10	8
Saare	15	15	7	3	15	3
Tartu	19	17	14	0	16	10
Valga	11	10	10	2	10	6
Viljandi	12	11	7	0	11	9
Võru	12	11	8	1	11	7
Total rural municipal.	**194**	**187**	**148**	**30**	**184**	**122**
%	*100*	*96*	*76*	*15*	*94*	*63*
Cities	**33**	**33**	**33**	**18**	**32**	**27**
%	*100*	*100*	*100*	*54*	*97*	*82*
Total	**227**	**221**	**181**	**48**	**216**	**149**
%	*100*	*97*	*80*	*21*	*95*	*66*

Source: *Information Society in Estonian Local Governments,* 2006.

Detailed information on services offered and simple interactive services (downloading of forms) are limited. Majority of local governments (69%) have document registry online with entries on incoming and outgoing correspondence, and 59% of them have made official forms downloadable,[47] but only 22% are disclosing drafts of acts using a separate menu item. WWW-based information request can be submitted in 50% of cases (see Table 22).

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[47] The study did not analyse if all official forms used are downloadable; even if there was one form available, the local government was considered as one providing downloadable forms.

Table 22. Web-sites of local governments: Advanced information and services

County	Number of local govt's	Office hours for appointments	Form	Document registry	Drafts of acts	Information request
arju	18	16	16	18	9	15
Hiiu	4	2	3	3	1	0
Ida-Viru	16	13	5	10	3	5
Jõgeva	10	7	8	8	0	5
Järva	11	9	3	8	2	4
Lääne	11	8	8	4	2	5
Lääne-Viru	13	9	5	8	1	10
Põlva	13	7	7	13	1	10
Pärnu	19	15	13	12	4	10
Rapla	10	8	7	4	3	6
Saare	15	5	8	2	3	7
Tartu	19	12	7	11	3	4
Valga	11	8	6	10	1	3
Viljandi	12	8	9	11	2	9
Võru	12	10	6	8	1	3
Total rural municipality	**194**	**137**	**111**	**130**	**36**	**92**
%	*100*	*70*	*57*	*67*	*19*	*47*
Cities	**33**	**24**	**24**	**27**	**13**	**21**
%	*100*	*73*	*73*	*82*	*39*	*63*
Total	**227**	**161**	**135**	**157**	**49**	**113**
%	*100*	*70*	*59*	*69*	*22*	*50*

Source: *Information Society in Estonian Local Governments,* 2006.

While the PKI is in place in Estonia and a two-way interaction, which includes processing of forms and authentication is available; information on such services is still not available on public websites. When logging on the Citizen Portal (see section 5.1) it can be observed that the total number of local governments accepting digitally signed documents is only 46 with Tartu City having the most advanced service (provides 14 public services). In fact, 24% of local governments use digital signatures to communicate with their respective constituents, 24% uses the service to communicate with other civil servants, and 18% communicate online with enterprises (*Information Society in Estonian Local Governments*, 2006).

II.5.6   mServices

In addition to the popularity of Internet based public services, Estonia is also well known in the field of mobile value-added services (mServices). Estonia was the first country in the world to have mobile positioning in commercial use and one of the first to have 112-emergency calls linked with mobile positioning system that can determine origins of each call. In fact, clients of all Estonian mobile operators can already pay for car parking via their mobile phones since 2000.[48]

Tartu City, in particular, has paid remarkable attention to the development of mServices. The services being offered and are currently being developed include: a) the mNeighbourhoodwatch (receives SMS-notifications on missing persons and stolen cars and other similar concerns); b) mLibrary (Tartu City library sending out notifications regarding availability of library entries); c) mTeacher (provides teachers with an interface to send important/urgent text messages to parents); and d) Tartu City short

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[48]   For an overview of mServices development and related factors, including case studies on mobile parking, mobile transport ticketing, and mobile commerce, see Rannu 2003.

code 1789 (provides means to inform or notify the city on information about broken traffic lights or street lamps, dangerous icicles, etc.) (Rannu and Semevsky 2005).

When 406 inhabitants of Tartu City was asked to rank the mServices by importance, the following results were generated: mParking was regarded to be the most necessary (82%), followed by the Tartu City short code 1789 (80%), and mTickets and mobile payments (72%). New mServices such as the mTeacher (85%), mNeighbourhood (82%), mLibrary (72%), and m-medicine (80%) also received high scores on the scale of necessity (Rannu and Semevsky, 2005, p. 9).

II.6   The systems and solutions in place, as well as the unsolved problems

II.6.1   Unsolved problems

Based on the results of the audit *Management of Government's IT Sector and Effectiveness of Development Plans* of 2005, the State Audit Office has proposed the following to the Minister of Finance:

- Regard/consider the development of information society in the state budget strategy as a cross-ministry area of activity until at least 2010.
- In the state budget strategy, allocate at least 1% of the state budget a year to the financing of IT. To ensure the stable functioning and development of state information systems, half of it should be directed into IT infrastructure and the other half into the development of information society.
- In the state budget strategy, on the basis of standard expenses developed in the Ministry of Economic Affairs and Communications for every financial year, provide funds based on computerised workplaces through the budget of state authorities to ensure the sustainable functioning of information society.
- Establish a common accounting of the actual expenditure of IT-infrastructure maintenance and its components in public administration.
- In the state budget strategy, ensure that innovative activity related to the development of the information society is carried out through the specific research programme on information society development that is financed through the budget of the Ministry of Economic Affairs and Communications and which also covers the projects carried out under the EU structural funds.

After analyzing these recommendations, the Minister of Finance concurred that the Ministry of Economic Affairs and Communications has sufficient capacity and basis to coordinate the development of state information systems as provided in its statutes. However, the Minister is not convinced that the development of information society should be made as a cross-ministry area of activity. While the Minister has no objections to the proposal to finance innovative activity in the development of the information society through the specific research programme being financed through the budget of the Ministry of Economic Affairs and Communications,[49] the Minister emphasized the need for an inter-ministerial agreement and approval of the cabinet of ministers before such procedure can be established. As for the proposal to allocate at least 1% of the state budget a year to the financing of IT, the Minister was not agreeable, on the grounds that it is not good practice to fix in the structure of state budget expenses in proportion of expenses related to the development of support services.

In consideration of the above, the following recommendations have been made to the Minister of Economic Affairs and Communications:

- For budgeting of the IT infrastructure expenses in state budget, present to the Ministry of Finance standard expenses for one workplace and rationale for such expense, taking into

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[49] As of 2006 such programme does not exist.

account the data on the potential of the IT infrastructure and its estimated growth in public administration for the coming financial year and price forecasts.

‒ Based on the 'General Principles of Estonian Information Policy' and the experience of the implementation of its plan of action and EU structural funds, develop and present to the Ministry of Finance for consideration in the new state budget strategy, a common specific research programme for developing the information society together with the proposed funding necessary for its execution.

‒ As for the financing of projects of specific research programmes, funding should be provided irrespective of which ministry is in charge for the execution of the project. Coordination/management, calculation and evaluation of their expenses and results should also be organised. Lastly, a report to the Government of the Republic on the execution of the specific research programme for the information society should be submitted annually.

The Minister of the Economic Affairs and Communications concurred with all observations and proposals.

While Estonia has put in place relatively advanced eHealth services, several specific problems on eHealth services development remain. First and foremost is the lack of a comprehensive eHealth strategy for the country. The draft document has not been developed further after December 2004 although planning and activities are running constantly.

Second and equally problematic is the lack of interoperability and standards. After several failed voluntary attempts by the ICT industry, MoSA has also failed to develop or facilitate the development of standards for consideration by all players in the field.

The slow start of the ambitious National Health Information System is also now facing several challenges: parallel development of standards and technical solution by different competing companies; inappropriate legal framework and threat of parliamentary standstill due to non-existing public debate on privacy concerns and insufficient funds for the development due to fast rising IT development costs (mainly human resource issue).

Many crucial partners – Estonian Health Insurance Fund, Estonian Medical Association, University of Tartu, and the patients – are not actively engaged in the development process and there is no clear strategy for communicating and establishing the added value for each of them

Although Estonian public organisations are obliged to follow Web Content Accessibility Guidelines (WCAG), the situation is not really so. In a study conducted regarding the compliance with WCAG from 2002, out of 64 websites analysed, 58 did not comply at all with the requirements.

Another issue is that while 79% of local governments have positive attitude regarding the future development of eServices, 17% remain unconvinced of its usefulness (*Information Society in Estonian Local Governments*, 2006).

II.7   The acceptance and usage of technologies and services[50]

eServices are generally well received and considered user-friendly by Estonian inhabitants. In a 2005 survey, 51% of respondents have considered them good, 27% as average, and 16% as very good (see Table 23).

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[50]   'eGovernance Usage' indicators from Eurostat for Estonia are questionable. For example, the percentage of enterprises using the Internet for interacting with public authorities has arguably decreased in 2004-2005. But, national studies do not support this. For this reason, the data from the TNS Emor studies are herein used.

Table 23. Usefulness of eServices provided by public authorities, 2005

	% of those using the Internet
Time saving	75%
Faster response/information	65%
Saving of resources	38%
More information sources, higher information quality	37%
Easier to combine family and work life	24%
Life has not become easier	9%

Source: TNS Emor, 2005.

It is important to note however, the various reasons for the dissatisfaction of users. People using the Internet for administrative affairs find the lack of personal contact with officials a major concern as there are no means to identify whether all administrative rules have been followed (see Table 24). A study of people who were not Internet users arrived at a similar conclusion in 2002. Moreover, it is perceived that in the management of personal affairs, the only perceived Internet partner is the Internet bank. A number of users still believe that each service and individual require different approaches and levels of service, as indicated in Kalkun and Kalvet (2002), "there is a common belief that civil servants need to be met personally (often many times) to reach the desired outcome", and as such Internet is not seen as a useful tool for public sector services by some.

Table 24. Usefulness of eServices provided by public authorities, 2005

	% of those using the Internet
No personal contact with officials, resulting in insecurity over whether the submitted documents have reached the targeted official and when the request will get a response	69%
Distrust in the security of eServices	64%
Use of eServices too complicated, lack of sufficient guidelines	57%
Lack of useful eServices	25%

Source: TNS Emor, 2005.

In terms of confidence in the security of eServices, the TNS Emor study showed a high percentage (64%) of distrust. However, if compared with earlier studies made, this matter is not considered an issue. In particular, among the EU and CEE candidate countries, Estonia has been one of those with the lower level of concerns on data security and privacy/confidentiality after Bulgaria and Hungary. Only 9% of regular Internet users are very concerned about data security in Estonia, compared with 24% in CEE and 26% in EU countries on average (20% in Switzerland and 40% in the United States of America). Similar results were found on concerns about privacy and confidentiality (*Statistical Indicators Benchmarking the Information Society,* 21).

This has also been confirmed by a study among Internet non-users. It was concluded that security is not an obstacle to become an Internet user. It was most often mentioned, "simple people like us have nothing to fear". Of all non-users, only 1% mentioned security concern as the reason for not using the Internet (Kalkun 2002, p. 32).

A lower level of concern has also been indicated in the recent pan-European comparisons: the share of individuals who have experienced fraudulent payment (credit or debit card use) or computer virus resulting in loss of information or time is lower compared to the EU average (Eurostat, 2006). And, as far as one can say, there have been no major security accidents in Estonia over the last years that could have explained such major shifts.

Twenty-five percent (25%) of the people have also mentioned the lack of useful eServices. Job search seems to be the most urgent field (see Table 25) where more is expected. Although in recent years,

online job advertising has gained popularity in Estonia. Apart from the services offered by the Labour Market Board, the CVO Group OÜ also operated their own portal (http://www.cvonline.ee/) with 817 job ads (as of 12 May 2006), and the CV Keskus OÜ (http://www.cvkeskus.ee/).

As health is one of the most searched topics in the Internet, people also expect to find more interactive solutions, which mostly aim at increased accessibility (i.e., online booking, consultations over Internet, etc.).

Table 25. Fields of life, where citizens expect more eServices, 2005

	% of those using the Internet
Job search	65%
Social affairs	52%
Health affairs	52%
Paying taxes	49%
Applying for personal identification documents	40%
Announcing about moving	38%
Car registration	33%
Enrolment to universities	30%
Communicating with the police	30%
In the field of childcare	29%
Applying for construction permits	20%
Applying for birth and/or marriage certificates	17%
Pet registration	14%

Source: TNS Emor, 2005.

Another approach is to increase general awareness about main portals as well as include additional services (Table 26).

Table 26. Awareness and usability of main portals, 2005

	aware of portal (% of Internet users)	users of portal (% of Internet users)
State Portal	47	25
Citizen Portal	27	9
Electronic State Gazette	51	35
eDemocracy Portal TOM	17	5

Source: TNS Emor, 2005.

Health service provision is very rich in information. This should in principle promote the use of computer and eServices as they significantly help health workers to be more efficient. Based on the official information made available by the MoSA, approximately two thirds of all health workers were using computer and Internet in 2005 (see Table 27). At that time 53% of general population between the age of 15 and 75 were Internet users. However, it is important to note, that among healthcare workers there are proportionally younger individuals who form the majority of Internet-users.

Table 27. Internet and computer use among healthcare workers, 2005

	Number of employees	Computer users out of all employees,%	Internet users out of all employees,%
All healthcare workers	25 481	66.9	65.1
Administration	1 764	90.7	88.9
Medical management staff	1 083	95.9	94.2
Doctors	4 335	92.6	91.2
Family doctors	908	93.2	91.1
Specialist doctors	2 972	91.8	90.4
Dentists	874	65.4	59.6
Nurses	8 269	73.7	71.5
Midwives	402	65.7	63.7

Source: Ministry of Social Affairs, 2006.

A study in 2003 shows that medical management staff and family doctors were the most active users of computer and Internet. According to another eUser study in the same year, 99% of family doctors had computers and 88% have Internet access in their consultation rooms – the best achievement among all accession countries (see Figure 18).

Figure 18. Percentage of family doctors with PC and Internet access in the consulting room
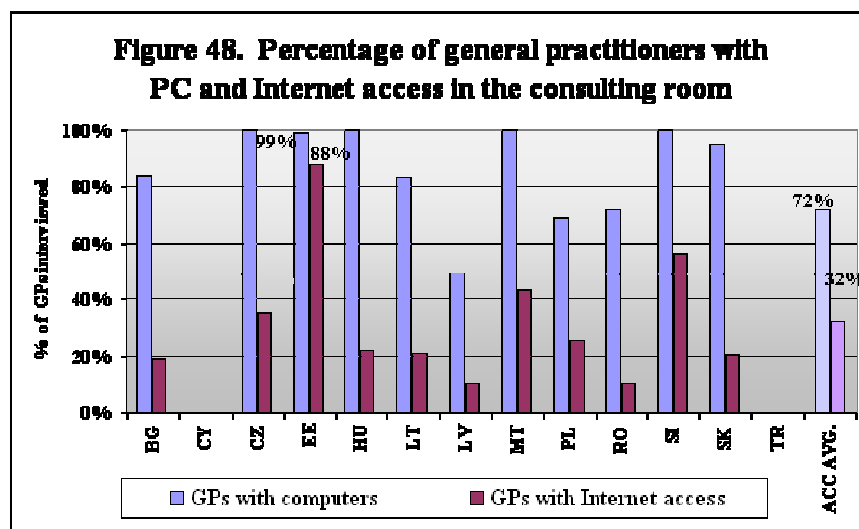
Source: Development of the information society in Estonia as mirrored in European surveys in 2003. Estonian Informatics Centre. Data from „eEurope+ Health Survey", June 2003. http://www.ria.ee/atp/?id=762 (Accessed January 12, 2006)

II.8   Assessing the impacts

Thus far, very few surveys and impact assessment studies on eGovernment/eHealth projects and policies have been conducted in Estonia. The most detailed ones are carried out by the State Audit Office.

In the field of eGovernment audits, the State Audit Office deals mainly with evaluation. Over the period 2000 to 2006 they have carried out the following audits related to ICT in public sector:

    – *Management of Government's IT Sector and Effectiveness of Development Plans*, 2005;

- *Effectiveness of Information Systems Development Projects*, 2004;
- *The Tiger Leap Program in Estonian Schools of General Education*, 2003;
- *Population Data in State Registries*, 2002;
- *Document Management Programme of Government Institutions 2000–2003*, 2001; and
- *Management of Local Libraries' IT-Infrastructure Development*, 2001.

The following are the key findings or summary of their latest report, which also provides analysis on the implementation of recommendations given in previous audit reports.

The point of departure of the 2005 audit was based from the *Principles of Information Policy for 2004-2006*, which states that under conditions of limited resources it is especially important to use the funds allocated for the development of state information systems effectively, and based on that organise the operations even more purposefully and with more coordination. However, all previous audits have indicated inconsistencies on the development of information systems and organisation of existing systems. The 2005 report arrives at the following conclusions:

- There is no overview of actual IT-related expenses. Coordination of the development of state information systems is the task of the Ministry of Economic Affairs and Communications. Every year the Ministry presents its opinion and proposals to the Ministry of Finance to be considered in the drafting of state budget. The Ministry of Finance takes it into consideration but cannot require other ministries to accurately follow the recommendations of the Ministry of Economic Affairs and Communications. Every minister has a right in his/her area of government to decide how they use the money allocated. The expenses planned for the operation and development of the information systems are not separately listed in state budget, they are regarded as part of management and investment costs of the authorities.

- It is not certain whether the money allocated to IT field is used in the best way intended. The major problem in the development of IT in the public sector is currently not the lack of money but the expediency of the use of the fund. And, it is not certain that the fund allocated for information systems from the state budget is used economically and for the intended purpose.

- The development of the information systems is not regarded as a cross-ministry area of activity. The ministries, except for the Ministry of Economic Affairs and Communications, do not regard the development of the information systems as a cross-ministry area of activity. For an item, such as the information systems, to be considered an area of activity it should be considered and established as an interest of the state as a whole. What matters to the ministries is to achieve the planned results in the areas of activity for which they are responsible. Actions related to IT are relevant only if it helps to achieve the main objectives of the specific ministry. There is no Ministry *de facto* responsible for the whole development of this area of activity.

- Poor coordination of the IT sector impedes the development of information society. The drafting of state budget lacks a mechanism that would ensure balanced and sustainable financing of the public sector's IT infrastructure as well as the integrated discussion on the development of information society. The differences in opinion between the Ministry of Finance and the Ministry of Economic Affairs and Communications on the organisation of financing and the methods of the coordination of the development of the state's IT sector impede the planning and financing of specific research programmes for the development of information society, and the evaluation of the expenses to this area of activity and their performance.

Thus far, the impact of eHealth in Estonia has not been quantitatively measured. However, there is anecdotal evidence that as current information systems of healthcare service providers are developed mainly for financial purposes, the clinical patient management can be biased by financial incentives of the provider. If now information system becomes a main tool for controlling health service utilisation (i.e., setting fixed prices and capping maximum number of services), it results to operative planning of

service provision on contractual economic indicators and not on clinical needs of the patients. Another result of this may be cream skimming of more profitable services or channelling patients from capitation-based payment of family doctors to fee-for-service paid specialist care. This phenomenon has not been explored in Estonia, but is well described in other countries.

Thus far, from experience it can be said that formal rules and clear financing – ministerial regulation plus base financing - were sufficient to achieve quick general computer use and literacy among family doctors. The lack of a clear strategy resulted to setbacks or uneven development in the hospital sector. However, all parts of health system still lack financial incentives for more sophisticated and numerous use of eServices. An example of such policy would be financial incentives for better performance or quality, which creates the demand for clinical information use additional to mere financial management.

III: ASSESSMENT OF THE CURRENT DEVELOPMENTS AND TRENDS

III.1 Main achievements and shortcomings

III.1.1 Summary of the current state and trend of eGovernment

Since the 1990s Estonia has made remarkable successes in information society development. Within a relatively short period Internet usage has skyrocketed, and eServices and mServices have found their place in the everyday life of the inhabitants of Estonia, increasing the quality of life as well as efficiency and effectiveness of the whole governance system.

Main achievements in eGovernment

The Estonian public sector has a **very good ICT infrastructure**. Practically all civil servants who need computers and Internet for their daily activities have been provided with them (see II.4.1).

On the part of the public sector, there are two major (horizontal) projects that have made such developments possible. First, government information systems and databases have been connected via the Internet through a service known as the **'X-Road'.** Today, X-Road is the implementation of unified interfaces for different existing databases and a data exchange layer, which allows officials as well as legal and natural persons to process data from national databases over the Internet within the limits of their authority (see II.4.3).

Second, the issue of the **Estonian ID-card**, which is a compulsory identity document for all citizens that includes electronic authentication and authorization mechanisms. As of October 2006, 1 003 113 ID cards were issued in Estonia, covering almost all of Estonia's citizens (population: 1.4 million). Without the existence of related public key infrastructure (PKI) several innovative eServices in Estonia would not have been possible (e.g., Internet-based eVoting) (see II.4.4).

Estonia is very advanced in terms of **number and sophistication of eGovernment services** available in the Internet. It is not only ahead of all other new EU member states, but it also fared higher than the majority of EU15 countries. eServices have developed from simple one-way communication services to two-way complicated solutions. Nowadays, more traditional and popular services (e.g., submitting tax forms over the Internet) as well as very advanced and unique solutions (e.g., Internet voting) can be found (see II.5.1 and II.5.3). **On-line banks** have also proven themselves as user-friendly gateways to eServices (see II.1.3.2).

Moreover, Estonia has been often reported as a country with **favourable legislative environment** towards eGovernment. Although there is currently no specific eGovernment law in Estonia, the most important aspects have been covered in the different legislative acts. For example, the Estonian Parliament Electoral Law mandates the use of eVoting on national level (with the use of ID cards) and it seems that Estonia is the only country in the EU with an eVoting law for national elections actually in place.

The **share of Internet users among the population is relatively high** – i.e., 58% of 15-74-year-old (see I.5). Estonian **inhabitants are also generally very positive towards the eServices** offered by public authorities which they also consider as user-friendly – i.e., 51% of respondents have considered eServices as good (see II.7).

Main shortcomings in eGovernment

Since 2005, former public sector leaders and private sector representatives have expressed some dissatisfaction regarding the development of eGovernment in Estonia (see for example, Siil 2005 and 2006; Tallo 2005). Some analysts share this sentiment (for an overview of State Audit Office analysis,

see II.8). The dissatisfaction stems from the perceived slow **developments in the field of eGovernment**. For some, Estonia has decelerated in its IT efforts in the recent years and many countries have already caught up or are surging ahead with their IT developments.

There is **lack of horizontal focus** in the development of information systems. Public organisations tend to work in a segmented fashion, prioritising only their own information needs, even in cases where particular interests are interlinked or should be subjected to the interests of public administration as a whole.

There is **no overview of actual IT-related expenses** (as IT costs are regarded only as part of management and investment costs of the authorities since 2002) making cost-benefit analysis difficult to perform.

Although local governments are well-equipped with ICT means, the extent of **eServices offered by local governments is limited** as well as the capacities to strategically develop information systems further (see II.5.4).

III.1.2   Summary of the current state and trend in eHealth

Estonia is in a relatively good position regarding eHealth services. ICT infrastructure is good, however there are still areas for further improvement. Majority of professionals and consumers has already begun using ICT in everyday life. Uptake of eServices use is quick once they become available. All these have been made possible with modest strategic planning by the Government. If only a single 'case' is considered then it could be said that all basic eHealth services are available in Estonia. Nevertheless, the effect of eServices at the systemic level is thus far modest.

Until recently the support by the central government in the development of eHealth has been mostly rhetorical. For instance, while the preparation of the Draft Master Plan for Health Information System started in 2001, until January 2007 it has not been approved. The main engine behind the development has been the Estonian Health Insurance Fund (EHIF), which has invested in the development of its own service and has required digital competency for its contractual partners (i.e., providers). A downside in this way of development is that information systems are mostly oriented towards the management of financial but not medical information.

Main achievements in eHealth

First, **computers and ICT became an integral and essential part of the working routine of family doctors**. Although ICT remained as a tool for financial and statistical data management.

Second, there are **several good eHealth pilot projects** and ICT developments among 'champion' providers – among the most advanced include working paperless transactions by the end of 2006 and the use telemedicine applications in providing cross-border services abroad. Basic level of ICT use among providers is also quite good given the resources available – all providers have at least the so-called first generation medical record and information system for financial claims management.

Currently, all basic eHealth services are available in Estonia – electronic medical records, ePrescription, eBooking, telemedicine, teleconsultations, online consultations etc. But since only a small number of providers and patients use them, these solutions have minimal effect on the systemic level. But in some cases, some institutions claim to implement a fully paperless operation by the end of 2006. There are also some smaller organisations that only meet the minimum standards by exchanging financial information with the Estonian Health Insurance Fund (EHIF).

The EHIF has played a lead role in these achievements as the driver of eHealth in Estonia, resulting in several practical applications with ever increasing sophistication. By 2006, **all standard procedures are almost fully automated** (namely: financial transaction between payer and providers, statistical reporting between providers and the state, insurance status management through insurance fund by employers, etc); individuals can also manage basic transactions with public administration using on-

line applications (namely: applying for social benefits, applying for supplemental coverage for drug costs from health insurance, etc).

The **launch of the National Health Information System in 2006** can be considered both an achievement and a shortcoming**.** On one hand, it is an ambitious project which requires certain clarity about the plans of public administrators. On the other hand, the project has had a slow start, containing a lot of risks and is most probably under funded.

The fact that '**once eServices are available, Estonians tend to use them actively'** reflects, to a large extent, the general favourable attitude among Estonians towards eServices and the quality of services they offer.

Main shortcomings in eHealth

Thus far in the area of health system, ICT is mostly used as a tool for data transfer without business process re-engineering. A **few new eServices** have improved in terms of quality, access and/or integration of health services, but not on a national scale. In other words, the eHealth services are yet to be explored to its full potential. The aggressive and rapid start or introduction of eHealth development was not sustained and progress has been modest since 2003.

The efficiency of the use of ICT in health system remains to be examined. Doctors use the computer mainly for purposes of: [a] input of basic medical data; and [b] access to both local and international professional or public information. At the same time, low investment and poor ICT infrastructure (i.e., very few computers and almost non-existing decision-support systems or specific support for treatment process integration) do not allow for the utilisation of eHealth's full potential.

In addition, even if data transfer process is automated, most information systems that providers use need a lot of human labour to compile data files for delivery to EHIF or to MoSA.

Due to a decentralised health system, most of the applications have been developed by several small companies or in-house IT-departments of hospitals, thus resulting in **poor interoperability** between different systems. The market has remained scattered, because of its small size and unclear policy environment, preventing private companies from consolidating and undertaking aggressive investments.

The central government's ambiguous role and poor policy has resulted in **limited investments in ICT** both from the providers and private sector. Activities of MoSA range from centrally purchasing software to advocating for *laissez faire* and market mechanisms. Several main functions of the state such as in methodology and capacity development, and in developing standards and legal framework are lagging behind. Many stakeholders within and around the health system are on the opinion that government investments in eHealth has been either too low or badly focused, or both.

While it is not universally agreed, it is apparent that the current **legal environment** is not suitable to implement the national level 'common health information continuum'. The main problems described are in connection with legal protection of rights and obligations of different parties (the patient, the provider and the government) in sharing and processing of information and making decisions with possible legal consequences if misuse is discovered. Ambiguity in data privacy matters at the EU level may also be a source for this confusion. In general, data privacy is usually interpreted in favour of the individual and not the society at large.

The Estonian health system has been driven towards increased financial efficiency; and without quality or performance goals there would be few incentives to develop more eServices. Many managers and decision-makers **lack the required competency** in using ICT in the most feasible way for the improvement of business processes.

Finally, the needed political support to eHealth development has not materialised beyond rhetoric. An approved strategic vision for national health policy, or a national health information policy, is still missing. Except from EHIF, public sector investment in eHealth is low.

III.2 Major factors affecting the evolution of eGovernment and eHealth

The major factors that have affected as well as contributed to the evolution of eGovernment and eHealth in Estonia include: [a] the economic factors, [b] policy and regulatory framework, [c] technological factors and competency, and [d] socio-cultural factors. Estonia has been a successful transition economy (i.e., in the area of macro-economic stabilization and economic integration to the EU), and this has positively impacted on the evolution of information society as well. Although it has been argued earlier that the development of Estonia in the domains of eGovernment and eHealth is characterised more as 'development-driven strategies' than a 'strategy-driven development', politics, public policy and legislation are crucial for further improvement to take place. It is important to acknowledge the ICT competencies of the Soviet legacy as well as the emergence of advanced telecommunications infrastructure. There are also some socio-cultural peculiarities that would explain the widespread ICT infrastructure in spite of relatively low living standards.

III.2.1 Economic factors

Since the re-establishment of Estonia's political and economic independence from the Soviet Union in August 1991, the country has undergone strong liberalisation in trade and foreign investment, thereby decreasing the State's direct involvement in economic life. The transition from a planned economy to a market economy was characterised by radical steps leading to relatively rapid macro-economic stabilisation compared to other transition economies.

Although Estonia suffered from over-industrialisation during the Soviet period, its economic structure was relatively favourable to the new economic structure – that is to say, large share of the industry was oriented towards higher value-added production, which took advantage of skilled labour and the portion of large-scale outdated industries was smaller especially when compared to other Soviet Republics. In order to allow technology transfer, the improvement of managerial skills and more effective market competition, large-scale privatisation was undertaken in Estonia and already by 1995 most companies were privatised. Indeed, privatisation has so far been one of the main factors influencing the inflow of foreign investment to Estonia and these have mostly originated from the neighbouring technology up-front countries of Finland and Sweden.

Rapid economic growth[51] and its direct results (e.g., increases in tax revenues to cover State ICT-investments) or indirect results (e.g., increases in living standards and thus more widespread home ICT-infrastructure) have certainly had positive impact on the Estonian information society development and on the emergence and acceptance of eServices. More specifically, a number of economic factors discussed below have contributed to the emergence of modern eGovernance and eHealth solutions.

The Estonian banking sector has been a standard-setter and catalyser of eServices. Banks have been the 'informal' leaders in the Estonian software industry and Internet banking services offered by the banks are widely trusted by the society. Banks also offer authentication services to access various public sector eServices and even ID cards and passports issued by the Citizenship and Migration Board can be delivered to inhabitants via bank offices.

In addition to the banking sector, there has also been enormous growth in the Estonian telecommunications sector (AS EMT, AS Elion) and in wholesale trade and business services. These

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[51] Although it is generally agreed that the Estonian economy has been successful in catching-up with developed countries via the application of technologies, work organisation and know-how imported from the more advanced countries, there are streams of studies arguing that major challenges lie ahead as long as the commitment to bring about the economic, social and environmental renewal proposed in the EU's Lisbon Strategy, which will involve using innovation as the motor for economic change, and developing a learning economy, is concerned. According to some studies (e.g., Tiits et al. 2003) the technological structure of Estonia's manufacturing industry has evolved since the mid 1990s towards less complexity, 'This in turn highlights that, despite an enviable record of economic growth, Estonia's industrial structure in 1996 was in better shape than in 2000' (*ibid*, 27).

are actually the sectors with the largest IT investment and positive externalities (on clustering in the Estonian ICT sector, see Kalvet et al. 2002). Banks and telecom operators are also behind several large-scale initiatives aimed at information society development (e.g., Look@World Foundation).

Several innovative software companies have been in strong partnership with the public sector to develop various eServices in the fields of eGovernment and eHealth.

One explanation to low financial commitment towards ICT **in health sector** is the overall low share of health expenditure in Estonia representing 5.3% of GDP in 2005. This is even more aggravated by heavy pressure to increase staff salary (30-40% raise in 2005) and chronically low level of capital investments in health sector. While the pressure from personnel is not about to change the basic investments, it will still get some (though rather modest) support from EU structural funds.

On the other hand, orientation towards increased efficiency through healthcare reforms has pushed for development of rather sophisticated ICT solutions for (financial) management by providers. This is particularly felt in recent years when a critical mass of resources has been coupled with increased understanding on the benefits of ICT use.

Small market and under funded healthcare system have also probably prevented private capital or even venture capital involvement in developing eHealth solutions. Even in the rapid growth phase that Estonian economy has enjoyed in the last years, the bold investors who entered the market have acknowledged that the length of ROI is very long (and not comparable to other sectors) and most probably not even possible within Estonia only.

By and large, the Estonian health sector has enjoyed a stable and predictable (although scarce) financial environment and non-contradictory sequence of successful reforms, though individual acts may have caused some confusion at times. This has enabled providers and Health Insurance Fund to develop visions and plans for the future within the existing limits, regardless of relatively low level of absolute resources available as compared to more developed economies.

III.2.2   Policy and regulatory framework

Attempts to build up an information society as well as a knowledge-based economy in Estonia extend far back in Estonian political history. The first information society strategy was prepared in 1994 and information society technologies have been a priority field since 2000 according to the research, development and innovation strategies. While there has been a general consensus among all political parties regarding the importance of developing an information society, linkages between political rhetoric and policies/action plans remain non-existent. For instance, technocrats have developed concrete information systems without the much-needed respective policies to guide and implement them. The importance of discussion and the early approval of a rather general information society strategy (e.g., *Principles of Estonian Information Policy*, 1998) rely most on their contribution to awareness building.

The provision of legislation is considered to be the main role of the State in building information society developments. Although there is currently no specific eGovernment law in Estonia, the most important aspects are covered in different legislative acts that provide for the use of the Internet in administrative affairs. For instance, the Public Information Act has been approved in 2000, guaranteeing electronic access to public information (including draft legislation) and electronic communication. Other very important legal acts were also approved early and no major modifications have been demanded from them (e.g., Digital Signatures Act, 2000).

The development of ICT projects in the field of eGovernment has been guided by two important and successful principles, which have been abandoned by now. First, when the co-ordination of the development of the State information systems was handled by the central co-ordinating unit at the State Chancellery, the inter-organisational dimension in the development of government eServices was strongly present. This was also supported by the project-based financing mechanism of ICT development projects. Moreover, the political elite in Estonia made ICT development a priority and

provided financial support – approximately 1% of the State budget each year has been spent on ICT over the last 10 years.

In the health sector the main political factors behind its development may have been brought about by general public attention to eGovernment development, which has facilitated the development of many eServices by big central government organisations, such as MoSA and especially EHIF.

A main driving force behind Estonian health reforms has been efficiency, strict budget control and a lot of decentralised autonomy (see also Chapter I, Section 5). It is not surprising then that the EHIF as the single major paying agency and the main public 'tool' to achieve the efficiency has also been very powerful in guiding the ICT development of providers. Through its contracting power EHIF has become the *de facto* ICT standard-setter.

Decentralised and autonomous provider network, plus financial motivation by main purchaser (i.e., EHIF) within a relatively stable environment, has promoted the development of individual (though incremental) eHealth solutions by all providers even after the failure of the centrally developed and government-funded electronic medical record development project. On the one hand, the autonomy has enabled the appearance of several innovative solutions. On the other hand, the lack of central coordination of standard development has prevented the good solutions from scaling up across country.

Legal factor *per se* in the health domain has not been playing a major role in eHealth service developments. However, reference to general law on public information has promoted the development of websites and some services by public authorities. Recently, data protection issues have been raised as potential barriers to the development of seamless nationwide health information systems. Although current data protection measures as laid down by the Personal Data Protection Act prevent linking of different databases, which mostly affected scientific research or data quality of national health registries. Perhaps the most influential regulation in terms of computerisation of family physicians was the possession of computer and Internet access as a prerequisite to get one's premises licensed since 2001.

In the last few years the specific feature of health sector in Estonia is the lack of universally accepted healthcare policy, which exists in satisfactory level only for hospital care, but not for primary or long-term care. Many experts and stakeholders have suggested that since the general health policy has not created the need for business process improvement (e.g., increased integration between service providers or quality as criterion for payment) and/or clear incentive mechanisms (preferably financial), it has accordingly prevented more intensive investment in eHealth solutions. Even in 2006 the National Health Information System is developed and led by technical experts, but not by Health or Public Health departments of MoSA.

III.2.3   Technological factors and competencies

Compared to other former Soviet Republics, Estonia was in a rather advantageous position because there was some ICT-manufacturing industry established in the country. During the Cold War, almost every former state-owned organisation had its computing centre in Estonia and the level of ICT-education provided by the Tallinn University of Technology and the University of Tartu was good. In the 1980s, specialists from Estonia participated in the development of standard software engineering, CASE tools, among others, for different ministries of the Soviet Union.

The Institute of Cybernetics (established in 1960 as an institute of the Estonian Academy of Sciences) at the Tallinn University of Technology had competencies in elaborating problem-oriented software systems and has reorganised itself into an interdisciplinary research institution that specialises in control theory, selected areas of applied mathematics and theoretical mechanics, and selected areas of computer science and information technology. The Institute has also been the motor of nearly all nationwide collaborative initiatives in the field of ICT.

The other important research and development competence centre is Cybernetica AS, established in 1997 as a spin-off of the Institute of Cybernetics, and is dealing with information security

(communications security products, digital signature technology), development of mission-critical systems and navigation systems development company. They were also involved in elaborating Estonian eVoting software.

There are also many software companies that are actively partnering with public institutions in the development of advanced solutions (e.g., Abobase Systems AS, AS Datel, AS Cell Networks, MicroLink Eesti AS, Real Systems AS, AS Regio, AS Webmedia, etc.).

Another technological factor contributing positively to the developments is the advanced fixed (including broadband) and mobile telecommunications infrastructure, created by Finnish-Swedish owned AS Eesti Telekom. From 1 January 2001, the Estonian telecommunications market is completely open to competition and service is offered by a variety of companies. Both providers as well as users have also picked up WiFi and WiMAX. The number of companies connected to the Internet is also on the rise. In the beginning of 2006, 97% of Estonian companies had a broadband Internet connection, of which ADSL connection is the most popular.

In the field of health the knowledge transfer about ICT use in service innovation was mainly driven by IT professionals but not health professionals until recently. This was possible due to lack of training and understanding about true potential and risks in using more ICT within the health sector. This applies to all levels of the system - from administrators and managers to basic healthcare workforce and citizens. For instance, there is no health/medical informatics discipline in any academic institution or major healthcare provider. There are several experts, mostly self-trained based on everyday practical experience. Health system exploited the generally favourable ICT expertise in Estonia. This approach worked for simple solutions, but recently as the need for service-oriented problem solutions and business process innovation has emerged. The enormous lack of medical informatics competence has been acknowledged. It became apparent when a university hospital's ambitious project to develop sophisticated EMR encountered several serious failures despite decent funding and high motivation by the leaders.

Estonian ICT research in some key eGovernment and eHealth fields (e.g., security) is on a good level and has been widely applied in Estonia (e.g., eVoting and ID-card solutions have been developed locally). Hence, there is no lack of competence in the country. Although foreign companies have been very active in the Estonian ICT market since the mid-1990s and they have been involved in the development of eGovernment solutions, local companies still play the key role. In the case of eBanking, the solutions developed in Estonia are also believed to be adopted and implemented in other countries after the biggest banks have been bought by foreign companies. In the area of eHealth, the situation is different and further competence is needed. However, it has been difficult to attract foreign competence into the healthcare system – ownership of providers is local by default and potential profit margin for foreign ICT-companies is very low in Estonia. This may however change in the future as the international competition to develop National Health Information System, which is funded by EU structural funds, was won by an international ICT giant.

III.2.4 Socio-cultural factors

It is generally agreed that there are some social and cultural peculiarities in the Nordic countries (and Estonia) that caused the Internet boom (Kalvet 2002, pp. 24-25). The same is quite true on the use of eGovernment and eHealth services. Although there are very few studies carried out on the topic, some potential socio-cultural factors that have contributed to the evolution and development of eGovernment and eHealth may be highlighted.

The general profile of Estonian Internet users and non-users is relatively similar to those in other countries, particularly in terms of barriers in the use of ICT such as: motivational, access and skill aspects (Kalkun and Kalvet, 2002).

The general image of the use of ICT is very positive in the Estonian society. It is important to note that among EU and CEE candidate countries, Estonia is one of the countries with a low level of concerns about data security and privacy/confidentiality. While there are no detailed studies available

investigating the reasons behind Estonian inhabitants' confidence/trust on online transactions compared to other people from other regions, it may be plausible to presume that the current situation has been caused by the existence of advanced and secure solutions, positive experiences with and positive image of online banking in Estonia. Though there have been security incidents involving online services, they have been handled in most appropriate ways, both in technical and public relations terms. This fostered the confidence-building and paved the way for sharing of very sensitive information (e.g., political preferences) over the Internet, and enabled the creation and further development of eVoting solutions.

ICT usage in healthcare has a generally good image and earned majority support from among both doctors and public. While medicine is generally considered as a conservative and sensitive area, whereby new developments/changes may not be automatically accepted by general public, some practitioners have been successful by highlighting the practical use of new technology. Public acceptance is made easier by emphasizing the real added value of eHealth.

New services are easily adopted or accepted by the general population as several positive cases have already been used and institutionalized such as everyday eServices like banking and filing of taxes. However, social services are still considered by many as requiring more personal interaction. Here the younger and more active segments of the population are the quick adapters.

However, even the healthcare and local ICT companies that have been active in Estonia still encounter several difficulties as in other sectors. It must be noted that despite the promotion for cooperation to the development of various eServices have encountered failures due to lack of voluntary cooperation among providers or eHealth solutions developers.

III.3 Drivers and barriers

Some of the drivers behind successful developments in the Estonian information society are those that are guaranteed rapid economic growth and developments in the private sector. Specifically, an important driver has been the **rapid development of the banking and telecommunications sectors**. In addition to the direct provision of very advanced eServices and telecommunications infrastructure, there are also indirect support coming from various sectors (e.g., Internet training for 100 000 people in Estonia and initiative 'Computer Protection 2009'; see Box 8).

Two major horizontal projects – **'X-Road'** and **Estonian ID card** – have not only been successful, they have also established a strong foundation to strengthen the current structure and build additional eGovernment and eHealth services. One hypothesis to explain the success of such large horizontal projects in Estonia has been the relative weakness and small financing power of individual vertical government institution, which has prevented them from developing their own full-scale solutions (e.g. identification applications) and has forced them to cooperate and use existing solutions. While acknowledging that this situation is difficult to replicate in a planned manner, it supports the idea of certain level of efficiency gain by central management of national ICT infrastructure strategy.

Main drivers in eGovernment

The advancement of information society, and especially of eGovernment, has been a **generally agreed consensual goal** by Estonia's leaders, public figures, as well as by the wider public since the beginning of 1990s. Discussions were professionally guided by a few prominent public figures. Most importantly, Estonia's political elite backed up its priorities with **strong financial support** – approximately 1% of the State budget has been spent on ICT each year over the last 10 years (see II.1.7). Another important guiding factor has been the existence of the **central coordinator** (but the latter, as well as the '1%- rule', have been abandoned by now).

With substantial ICT investments in the development of the public sector information systems and implementation of the several-targeted projects, a **good ICT infrastructure** in public administration (both local and central government) was established as early as in the mid-1990s. There have been

enthusiastic and visionary civil servants behind the development of public sector information systems.

The **approval of legislative acts and various regulations** that put strong emphasis on the opportunities offered by the Internet reflects the political support for information society development. Although some political parties (which have rural population as their main electorate) have recently voiced criticism on the implementation of eVoting in Estonia on the basis of the conflict with the constitutional principles of secrecy, generality, and uniformity and the possibility of having technical problems and dangers. In spite of this, further development of eServices still enjoys general political support.

The emergence of a number of eGovernment services has been caused by and/or catalysed by activities of **non-governmental organisations**. For example, the work of the George Soros-funded NGO, Open Estonia Foundation, in the late in 1990s have resulted to the very first versions of the now very popular citizen portal, the posting of all Estonian legislations online as well as of various most popular administrative forms on the Internet. The work of the Foundation also created further public expectations. **Public-private partnership** (PPP) has continued further. Today, authentication mechanisms provided by banks are used widely to access public sector eServices, and a joint initiative (Public Key Infrastructure) gave a basis for further development.

Main drivers in eHealth

All the general drivers for eGovernment described in previous section are also main drivers in the development of eHealth services.

In addition, well-articulated, universally accepted and implemented **national healthcare policy**, which provides the objectives that create real need and foresee incentives for greater adaptation of eServices within healthcare service provision, is the most often cited crucial driver for further advancement of eHealth in Estonia. As one senior government official noted: '*under-financing and lack of policy support cannot be substituted with muddling-through-policy by civil servants*'. The initial success of eHealth development in Estonia in particular and eEstonia in general cannot be made sustainable if the old 'civil servant championing' is assumed. This new healthcare policy can potentially lead to **structural changes in healthcare system**, which would require the support of ICT solutions (see I.5).

Leadership by and cooperation between central agencies - Estonian Health Insurance Fund (EHIF), Ministry of Social Affairs, Healthcare Agency - in the development of their respective eServices, and setting up of standards for service quality, can create powerful incentives for autonomous providers. So far EHIF has led the development of eHealth in Estonia.

Smart **involvement of private capital** can be a driver to quicker development of the policies as well as to the promotion of sharing/distribution of R&D experiences from other sectors. As discussed above the current healthcare financing principles in Estonia allow large-scale investments only from a few big providers or through government support. At the same time, autonomy of providers has the potential to enable the creation of market incentives for private capital to develop eServices if long-term stability and incentives for healthcare providers are promoted by government and insurance fund. So far, it has been used in a limited way, but the first 'paperless' health establishment is the largest out-patient clinic, which is owned by private capital. Again, there are many ways to develop PPP practices, but the most important prerequisite is a transparent and sound policy so that risks can be considered and balanced by both sides.

Main barriers

Some barriers to the further development of information society in Estonia are related to the **general weakness of the Estonian economic system** (i.e., low level of value-added in economy and the sub-

contracting nature of the economy, and low level of GDP per capita) and large regional disparities. Digital divide also exists in Estonia (see Section 5 in Introduction).

Small market size, plus system- and language-specificity, hinder some foreign companies from bringing in their knowledge and experience to Estonia. Furthermore, given the size of the country it is probably an issue that services, which are very language- or context-specific (such as health services), may lack the critical mass for rapid development if the pool of peers is small. Reluctance to learn from the practices of other countries also impedes IT development.

An emerging bottleneck is the **limited availability of skilled ICT personnel**. A recent study (Kattel and Kalvet, 2006) suggests that ICT education is a major problem for Estonian entrepreneurs that prevent the further introduction of innovative ICT-based solutions. The same is probably true in the cases of the eGovernment and eHealth sectors. Lack of understanding and knowledge has been described at all levels – civil servants, providers and sellers (in case of eHealth) and individuals. While sellers can potentially import the know-how from abroad, local competence is needed among other parties.

Main barriers in eGovernment

In addition to the limited skilled ICT-personnel available, IT developments have so far rested on a **few enthusiastic civil servants.** And, since some of them have left the civil service, the whole co-ordination system has been affected.[52]

The tendency of public administration agencies or various organizations to prioritise/focus solely on the development of their respective information systems is also an impediment to the development of eGovernment services. The present **financing model** is characterized by such **lack of horizontal focus** (see II.8). As a result, there has been a clamour for institutional change for a more holistic view and approach on governance (i.e., interconnection of aspects such as technology, organisation, legislation) of ICT projects in the public sector.[53]

Another serious barrier is related to the **weakness of local governments.** The administrative capacities of local governments vary in terms of ICT. While ICT is available in all local governments, the amount of eServices offered is different and so are the capacities to strategically develop information systems further (see II.5.4).

Although there have been some problems in the **field of interoperability**, a recently approved State Interoperability Framework and the related documents – which are elaborated at the initiative of the Ministry of Economic Affairs and Communications and involving IT experts representing the central and the local government agencies as well as organisations from the third and the private sector (see II.4.2) – could certainly lower the barrier. Nonetheless, ensuring its implementation remains the main challenge.

Estonia has been often reported as a country with favourable legislative environment towards ICT, but neither at the level of the central government nor the local government a provision of eServices is actually mandatory. Another issue is that relatively little information is available in the Russian language or in a format that can be used by disabled people (compliance to Web Content Accessibility Guidelines). There are still **improvements needed in legislation,** for instance**,** elaboration of eServices related to online company registration requires legislative changes and not only technical solutions. Full **implementation of legislative acts** remains a problem (e.g., Public Information Act, see II.5.4).

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[52] This, however, is difficult to verify.

[53] For a similar debate on the relations of ICT-based technological innovation and social, organisational and cultural aspects, see Nicholas Carr 'IT Doesn't Matter' (*Harvard Business Review*, May 2003) and the follow-up discussion (e.g., Howard Smith and Peter Fingar, *IT Doesn't Matter-Business Processes Do: A Critical Analysis of Nicholas Carr's I.T. Article in the Harvard Business Review*, 2003).

Lack of awareness of the existing eServices among the wider population is also emerging as a major concern (e.g., 27% of Internet users were not aware of the Citizen Portal; see also II.7).

Main barriers in eHealth

The **co-ordinating role of the central government** (i.e., the Ministry of Social Affairs) has been relatively poor. This function has become increasingly important, especially in a decentralised but strongly regulated Estonian healthcare system. The lack of positive coordinating role of the government is especially felt in recent years, in particular, the lack of common rules and standards for eServices as well as data exchange within health sector impeded further development. While problems have been defined and communicated by different experts and analyses since 2002, it was only in 2006 to 2007 that some positive results were seen to have been taking place.

Managing varying opinions and conflicting interests of stakeholders is a new role for government, which has mostly used only its regulatory power. Smart advocacy and strategic alliance building are important success factors in management reform, which is probably the most difficult part of eHealth 'revolution'. Estonia, learning from the obstacles and problems in the past, is now more ready and capable to address the issues created by scattered and uncoordinated development.

An eHealth specific issue is **low R&D capacity and ignorance of available solutions**, together with low competence of decision makers in general management and/or the reasonable scope of ICT in meeting one's needs may block or divert good initiatives if not addressed properly. An obstacle may be the lack of technical as well as system level experts, or lack of basic public health knowledge, such as bioethics, health economics, epidemiology, which can be further aggravated by missing systematic (and institutionalised) methodology development.

Lack of investment capacity (or willingness to invest) can be seen as a barrier that cannot be compensated by other means. Both the government and providers must drastically increase ICT expenditure in the health sector through targeted prioritisation. Even though ICT spending has increased in recent years for both the government and providers, it is still lagging behind most advanced countries when it comes to eHealth. However, it can be (and should be) facilitated by appropriate administrative and policy incentives as described in Section 2.2.

For eHealth services, **organisational and financial barriers** are probably more relevant if one considers past developments. However, further development of the whole National Health Information System is by far pending on major legal changes (new eHealth law), mostly dealing with access and sharing of medical information, but also the changing responsibilities of patients as well as doctors regarding the use of data.

Lack of interoperability can be a barrier for quite some time in investment-intensive areas, such as ICT and healthcare. Lack of interoperability is very much related with uncoordinated development strategy. Here, supranational (EU- or global level) activity in developing standards can help to overcome inefficient debates inside the country. This should be managed in non-restrictive way, but rather through active participation and engagement of concerned parties.

If central administration is too much concentrated on its own needs (e.g., developing systems that facilitate the use of eServices but not the services *per se*) or lacks end-user oriented applications then advancement will be impeded. It is also important to engage all stakeholders in the development of eServices in healthcare.

Development of **standards for services as well as for data exchange** is necessary to facilitate further development and scaling up of existing eHealth solutions. Acknowledging the further integration of European and even global healthcare systems is preferable if such standards are global or at least agreed at, and promoted from the European level.

The same issue of **balancing the funds for central and local needs**, as described for eGovernment, also applies to health system. Apart from the development of the central system (National Health Information System, NHIS) adequate support to providers of health services is necessary in order to achieve sufficient investment in service improvement, including eHealth development. Only the few

largest providers have critical amount of money available for development of ICT solutions for their own needs, while most of the service providers will have to settle with the options offered by small local sellers who are facing the limitation of small market as described above.

Even though the **legal framework** in Estonia is not yet seen as a main barrier, there is increasing concern about data privacy. If individual and societal interests will not be openly sorted out, it may obstruct the further necessary steps to be undertaken. Currently, a problem is seen as regards the perceived vagueness of data privacy and protection legislation as defined at the EU level. This, as a consequence, enables varying interpretations and is a potential source of problems not only for Estonia but also to other EU countries.

As for socio-cultural factors, it has been mentioned that very little is known about the effect of ICT and use of eServices in healthcare on the psychology and **behaviour of different players**. Doctors/providers may fear disclosure of their information to other participants in the system and therefore refuse to take it up. The same applies potentially to patients – they may refuse to disclose their data if the level of trust is not high enough for them.

IV. ANALYSIS OF THE POLICY OPTIONS

Estonia has been successful in developing eGovernment and eHealth services. Currently, a generally very favourable infrastructure exists. Two major horizontal projects –'X-Road' and ID-card – have been successfully implemented. The legislative framework is favourable in the case of eGovernment. Advanced eServices have been introduced and there is general readiness to use such services by public and private organisations, and individuals in Estonia.

However, more challenges lie ahead. In the case of eGovernment there is lack of horizontal focus in the implementation of information systems due to lack of a co-ordinating structure and the current financing model. Although local governments are well equipped with ICT, the extent of eServices offered by local governments is limited and so are the capacities to strategically develop information systems further. Although favourable eGovernment legislation is existent in Estonia, ensuring its implementation as well as further improvements are highly important.

In the case of eHealth, the general conclusion is that until about 2003 the development in Estonia was rapid and successful. The health sector was able to take advantage of the positive environment created for the development of ICT, which includes the decentralised care delivery system and enthusiasm of some individuals. While the central government leadership was weak, the health insurance fund has taken the lead and created momentum for development. It is believed that scattered and uncoordinated development in the past will be addressed through formal guidance and common rules. These initiatives are expected to boost eHealth into the next rapid development phase.

A challenge to both fields is the limited availability of skilled ICT personnel. There have been some problems in the field of interoperability. Although a recently approved State Interoperability Framework has a lot of potential, its implementation needs to be ensured. However, the general population is still unaware of many important eServices, and digital divide remains a problem.

Government interference can be and should be smart and engaging to all. The government should lead by example and work towards the encouragement of private capital investments. A further step (that could not be made within the current project due to its limited nature) should be the design of concrete policy measures with detailed timescales and division of responsibilities, impact and risk assessments, and success indicators, etc.

Strengthening central co-ordination in eGovernment

The objective of the following measures is to encourage the strengthening of central co-ordination of eGovernment management, as ICT-issues are very much inter-organisational.

The central co-ordination unit of eGovernment in Estonia is currently the Department of State Information Systems at the Ministry of Economic Affairs and Communications. Until 2001 the State Chancellery served as the key co-ordinating organisation. However, both models are characterised by shortcomings because in both cases co-ordination work is carried out at the level of organisational department. And in both cases those departments lacked legislative support for their role as central coordinator, leaving them as 'soft coordinators' (i.e., advisory entity but has no liability; facilitate the gathering of people together to create a common understanding for proposed tasks). But ICT issues are very much inter-organisational and require support from top management of various organisations to achieve true integration of ICT into administrative affairs (i.e., a holistic approach to governance: interconnection of technological, organisational and legislative aspects). The fact that Estonian administrative culture does not favour inter-organisational joint projects makes the situation even more complicated.

While it is commonly agreed that an institution with real power to guarantee implementation in ICT management is very much needed, a very clear and widely approved solution to this issue is missing.

People interviewed suggest that establishment of a separate Ministry is not realistic. Some experts have advised the establishment of a separate 'Public Administration Modernisation Bureau' under the State Chancellery whereby several departments of various organisations dealing with horizontal themes but facing previously mentioned problems could be brought together. These include the Department of State Information Systems of the Ministry of Economic Affairs and Communications and the Department of Information Systems and Document Management of the State Chancellery. The latter is responsible for the co-ordination of document management and archiving information systems. Some other units dealing with more general public administration and civil service issues (from the Ministry of Finance and the State Chancellery, respectively) could also be included. In order to guarantee political support, it would be best to appoint a Minister (without portfolio).

A related issue is improvement of the funding model. There is currently no clear overview of ICT costs making cost-benefit analysis difficult to perform, and priority funding of important horizontal ICT projects cannot be done. Although the principle of subsidiarity is important in public administration, there are some horizontally relevant projects in which many organisations should participate and one's interests should be subjected to the interests of the state as a whole. Thus, the coordinating structure of central information systems must be re-equipped with such policy instrument (which, in fact, existed earlier in Estonia). Due to the logic of EU Structural Funds and their management, such project based funding (central selection, preference to horizontal projects) will be used in the forthcoming programming period (2007-2013), and will probably give further boost to the development of eGovernment services.

Strengthening central co-ordination in eHealth

The goal of the following measures is to boost up the development of eHealth in Estonia through improved central coordination of strategic components and government stewardship that follows robust national plan for eHealth.

The stewardship plan must both be a regulatory framework with public relations strategy and a change management plan - a vision with long perspective where several scenarios to cope with uncertainties are needed. Its potential is increased if serious and feasible business plan will be drawn and implemented together with clear links with general health policy goals, such as increased integration and improved efficiency within the health system, causing possible structural changes.

Currently, the Estonian health system is fragmented. This means that there are several independent players. Each player is oriented towards internal efficiency, and yet as a collective, they are too small to take all the risks that big upfront ICT investments in healthcare require. Real gains from eHealth become reasonable if a critical mass of usage is generated. In healthcare, this can be achieved only through efficient interoperability while maintaining high levels of trust.

The health sector has always been a field of conflicting interests and hence the role of government as honest broker between stakeholders is widely accepted. No matter how restrictive or lax the regulations are, the government has tools, legitimacy and therefore obligation to purposefully promote cooperation between the wide spectrum of public and private (including citizens) actors in the health domain. eHealth is changing the traditional understanding of health services. It is also changing the power division and can create potential for shifting responsibilities. A change of paradigm of this scale needs persistent and intelligent management. Constant and open provision of information is the least a government can do, but also strategic action to respond new challenges by combining persuasion, regulation, financing and negotiation.

The role of the government is critical in this respect. Some lessons may be learned from the experiences of the US and Denmark which support the idea that systematic, but not necessarily intrusive, government action can boost eHealth development within a very short time.

Active investment in eHealth solutions from each player as well as from private capital would have potential impact on the overall development of the field in Estonia. The mechanism for this change could be through increased certainty and sound incentive mechanisms for providers and/or individuals.

Facilitation of the development of standards enables smaller developers to continue their independent but possibly innovative activities. It also fosters further international collaboration and health system integration.

This approach is currently being adopted in the Ministry of Social Affairs, and the implementation is foreseen within the next few years. This kind of strategy can bring results within a relatively short time period – in a year or two – if conducted well and with the support of stakeholders. However, the risks have not all disappeared. There are many sceptics because there has been a slow start and the leadership is not seen most encouraging for various reasons, and especially because the division of tasks between the ministry and the Estonian E-Health foundation is unclear.

Policy success can be measured if eHealth development speeds up remarkably (i.e., more eHealth services with high usage). The existence of high trust and a positive attitude towards cooperation and future developments among stakeholders and private capital have brought in investments.

Closely linked with the abovementioned challenges are health system reforms and a sound general health policy. Currently, there is a great deal of uncertainty about the vision of sectoral health policy, including such issues as integration of service layers within healthcare (from primary to tertiary care) and integration of health and social services, but also on the importance of performance and quality targets in service development. Structural reform *per se* is seen as a prerequisite for eHealth development, if the latter is a goal in itself. However, if there is a true need for structural reforms, this must take place regardless of the application of eHealth, while smart use of technologies can facilitate the reform process. It has also been extensively manifested in international experience that 'strong health policy and clinical leadership that guides a flexible and regularly reviewed eHealth strategy' is an important prerequisite for success (Stroetmann et al. 2006).

For eHealth purposes, the success of the general health policy is felt if the need for ICT solutions is as natural as the support to real policy goal. A very powerful vehicle for rapid and reasonable eHealth development is the use of cost-benefit analysis in justifying the need for investments.

Supporting local governments in eGovernment services

The objective of the following measure is to support local governments in introducing and developing eServices in terms of the provision of financial resources, and most importantly of ICT competencies.

According to the Estonian administrative system all local issues are resolved and managed by local governments. Duties by central government may be imposed, but these have to be funded by the State budget. However, the allocation of financial resources for the fulfilment of such tasks has been generally scarce and other income sources (mainly personal income tax revenues) of different cities and rural municipalities differ largely. In the end, this has led to the situation where administrative capacities and ICT are very different (i.e., while ICT is available in all local governments, the amount of eServices offered is different and so are the capacities to strategically develop information systems further). The cities of Tallinn and Tartu stand out as exemplars offering many advanced services, including mServices. Most of the local governments offer basic services prescribed by legal acts, but introduction of eServices leading to the implementation of good governance to achieve more openness, transparency, accountability remain to be seen. A recent study, the *Information Society in Estonian Local Governments* (2006), and interviews carried out during the conduct of this project arrive at the same conclusion that the most reasonable way to achieve these good governance goals is through better organisational arrangement between central and local governments.

In particular, a bigger role could be allocated to county governments because they represent the interests of the State in the counties and have stronger ICT competencies. They are also the usual partner institutions for local governments in State affairs. There are already good practices of county governments supporting local governments, but so far these have been based on personal initiatives and are not on a systemic nature. The role of central government should be clarified as well. Currently,

54% of local governments consider co-operation as insufficient and only 3% consider it as good (*Information Society in Estonian Local Governments* 2006).

Considering the state-of-the-art Estonian central information systems (e.g., X-Road, PKI) and their direct relevance to the provision of local eServices, on the one hand, and lack of ICT-capacities on local level, on the other, it is important to develop information systems and eServices of local governments in co-operation between central and local governments. In more concrete terms, this could be the development of virtual workplace for local governments that includes modules on document management, accounting, GIS, etc. The Citizen Portal should be better integrated into the system as well. Its development is not a technological issue, but mainly organisational in which the solutions needed are arrived at through active participation among local governments, their unions, the Ministry of Economic Affairs and Communications, Ministry of Internal Affairs, Estonian Informatics Center, etc. In any case, there should be more cooperation between central and local governments in policy planning and the design of policy instruments, as well as in service delivery. According to widely recognised one-stop shop approach all public sector services must be available from the 'same window', be it at central government, city or rural municipality level.

Thus, more emphasis should be put on local governments especially in key strategies (e.g., in the Estonian Information Society Policy). Even a national programme for local government eServices might be reasonable with enough funding from central sources for its implementation.

Targeted funding of strategic or killer-applications in eHealth

The goal of this measure is to promote the overall development of eHealth services and its usage through investment of time and money in few, but well-focused, projects with measurable outcomes.

It is possible to foster growth in certain areas if critical or high-potential elements in the system are specifically supported. Before implementing one grand plan for everybody and against all problems, it is wise to boost eHealth developments in Estonia by smart and targeted action.

In order to overcome the general complexity and strong inertia of healthcare system, implementation **of small-scale well-targeted applications** has the potential for immediate success and thus can generate necessary momentum for larger endeavours. Such projects must have proven efficiency and clear beneficiaries, such as ePrescription (to reduce medication errors), eBooking (to facilitate access to health services), digital image bank (to facilitate integration among providers and improve resource use). Moreover, conscious and targeted investments in **ICT solutions for end-users** – physicians, nurses, and individuals alike – make eHealth alive and release its potential. Without these services the central information system will not add much value and it is difficult to advocate for them.

In practical terms, if some good eServices in the health domain are tested and well-accepted, it would have strong facilitating and enabling effect for further service development. So far the EHIF, with its active development work and committed investments in ICT, has played the necessary role. It is important to show all stakeholders their gains in changing the old practices while implementing eServices. The notion of digital divide must be kept in mind as e-component cannot overtake the basic nature of the service.

Another aspect of this policy measure is that **systematic funding of innovations in healthcare**, including eServices development, should be prioritized in the development of Estonian health system. In order to scale up and improve health service provision with the help of ICT the country needs systematic and strong financing of eHealth development. For as long as providers spend merely 2.4% of their revenues on ICT, and NHIS development remains under funded, the expectations from eHealth cannot be met.

The financial measures must be versatile and flexible, using direct project-type funding, indirect financial incentives within routine funding schemes, as well as smart involvement of private capital through PPP. If financing is suboptimal, the main loss will be in the competence, as was mentioned in

an interview with a senior decision-maker. The same applies to the integration of health technology assessment into eServices development.

It is perhaps not useful to identify a certain moment when targeted funding of innovation using ICT as a policy measure will be completed. Radical and paradigmatic change in the health service provision is foreseen globally in the near future due to development in genetics, challenges from ageing and chronic diseases epidemics, as well as the looming bankruptcy of current healthcare organisation. Nevertheless, the expected outcome from this policy ranges from feeding the general spirit of innovation (with potential of collateral effect even outside ICT use) to real business process innovation and behavioural change of organisations or individuals.

A specific goal for the government here is to link policy challenges with applied use of ICT in a feasible and accountable manner. The success can be measured by successful and rapid implementation of eHealth services with high level of satisfaction among users and policymakers. There remains always the risk of committing mistakes, but smart and transparent involvement of private capital (see below) can mitigate the risks of low competency, and bureaucratic inefficiency or political corruption.

Improvement of legislative environment and its implementation

Estonia has often been reported as a country with favourable legislative environment towards ICT. However, this research shows that there some shortcomings remain. First, the provision of eServices is not actually mandatory at both central and local government levels. Injunctions set by various Acts are sometimes vague and sometimes not being followed as well. Thus, legislative acts should prescribe more details, especially in the case of local governments. Considering that a large share of the population is Russian-speaking, both basic information as well as eServices, must also be available in the Russian language.

Although Estonian public organisations are obliged to follow Web Content Accessibility Guidelines (WCAG), the latter are not being followed. As such, more emphasis should be put to ensure the implementation of the Interoperability Framework.

Developing rules and standards

The goal of the measure is to develop and maintain sufficient and a working set of rules and standards to guide all stakeholders.

The need for widely (possibly universally) accepted standards for eHealth is probably one issue, which everybody agrees on. The standards are needed for describing information as well as data transfer. Notwithstanding this general agreement on the need for common standards, voluntary agreement has not worked out in Estonia despite several attempts. Developing and/or promoting standards remain the most important tasks of central government (Estonian E-Health Foundation in Estonia). It must be done in close cooperation with domestic experts and stakeholders, as well as with international initiatives. Scattered development of small-scale applications by individual autonomous actors has not resulted in nationwide eServices mainly due to lack of standards for interoperability.

The impact of standards, once accepted by most, if not, all actors, is probably rapid spread and scaling-up of successful existing eHealth services. But it also creates much more favourable conditions for any new innovation.

Currently, the Ministry of Social Affairs has contracted out the development and definition of all necessary standards, which will then be stated as mandatory by law. Regardless of the fate of this approach, it is obvious that the process is lengthy and there may be further corrective steps needed by the government. If strong professional or institutional organisation is lacking in the country (as is the case in Estonia) the most appropriate organisation for taking the lead in standard-development is the central government.

Since the implementation of universal standards shall not be easy by any means, the whole process of standard development must be transparent and participatory and with clear time frame. If guidance from EU institutions is provided, or if there appears to be wider agreement between large groups of EU Member States, it can have favourable effect on coming to an agreement in the individual countries.

Strengthening ICT education

A recent study (Kattel and Kalvet, 2006) suggests that ICT education is a major problem for Estonian entrepreneurs to further introduce innovative ICT-based solutions. Some of the important shortcomings that were brought out were insufficient specialisation and also weak education (e.g., systems analysis) in certain areas. In particular, people who have acquired higher education need a couple of months or a year before they meet the requirements and interests of companies or public agencies. The knowledge and skill base of people is relatively low.

Some of the policy recommendations include curricula changes toward more inter-disciplinary ones, adding more practical tasks in curricula, and performance of projects as group work (for a detailed discussion, see Kattel and Kalvet 2006). ICT students should be introduced to the specificities of public administration. Some educational establishments have introduced a topic on technical communication in their ICT programs, but the teaching of strategic dimension of ICT to future civil servants is very weak. In addition to improving the curricula, it is significant to attract the youth to study ICT.

Apart from promoting knowledge-base in the ICT sector, this policy measure should also aim at improving links and mutual understanding between ICT and other sectors. In the case of eHealth disciplines like medical and health informatics, a sufficient level in academic setting is required for its further advancement, and then increased sophistication of eServices in the health sector can be expected.

An emerging issue in national innovation systems debates is the international mobility of human resources, especially of those related to science and technology. It has been suggested that the migration of skilled labour has a direct economic impact on host countries due to gains in skills, 'brain gain', the reduction of labour shortages, etc. (OECD 2001). Since the restoration of its independence, Estonia has generally been closed for immigration. But considering the challenges the country is facing, it needs to change its immigration policy and allow the inflow of skilled personnel. Although public administration organisations would not probably employ such ICT experts (because of language issues, lack of knowledge of local administrative system, etc), the effect would still be significant as private sector companies employing additional ICT staff, would be able to provide more advanced ICT-solutions more quickly. Such skilled experts could also be employed by the public sector as consultants for the elaboration of procurement documents that would later on lead to the procurement of innovation-intensive ICT-solutions.

eHealth policy option: Pooling together competencies

The goal of this measure is to promote interdisciplinary and evidence-based approach in planning, development, implementation and evaluation of all other eService measures.

Technological development depends on competencies available and the efficiency it engenders. Building the technical knowledge-base and creating/supporting preconditions for its use is one very important strategic role of the government. The small population and the complexity of the system are factors that raise specific challenges for eHealth developments in Estonia.

Family doctors, some privately operating small specialist care providers, and also smaller hospitals cannot offer market incentives for competing sellers. Based on the argument that ICT solutions for health systems are very context-specific, all R&D for eHealth solutions have been done by local

companies with very limited transfer of foreign know-how. A major leap from the current situation may benefit remarkably through government 'interference'.

A balanced central and local, public and private development of relevant eServices should be backed up with methodological and technological support at the national level through the promotion of standards, exchange of information, and facilitation of pooling similar interests. Adequate support to robust private companies in strategic areas must also be carried on at the national level. This support may come from a dedicated government institution or in cooperation with an academic centre or professional organisation. In any case the government can and should facilitate the existence of such competence centres.

It appears that after the first successful phase a more systematic and sophisticated approach to eHealth services development is needed. This means empowering all stakeholders in the field by promoting better understanding and knowledge not only about the new challenges for core service and system development, but also on how ICT can add value, and not merely additional costs, in time and money. Building eHealth as a separate discipline must be avoided, instead a common understanding between different specialists about the new health and health system paradigm should be created, which in many ways is practically enabled through smart application of ICT.

The goal must be the development of core services and system with ICT adding real value and not just additional costs in time and money. In practical terms, a national lead in systematic methodology development is needed to monitor and analyze situations, and promote medical/health informatics training for key professionals and the public as well. Furthermore, more funding is needed to 'buy competence', as a senior policymaker puts it.

Effect of this policy measure is wide and long-lasting. A downside of this policy is the long manifestation of results and high investment required.

Policy option: Cross-border services and knowledge transfer

A small, but potentially very useful measure to support eHealth development in Estonia is to promote international (pan-European but also global) cooperation in the field.

It aims at a better understanding on what works and what does not, why it works and why it does not, and what is important and what are the health gains. This type of cooperation may consist of international forums of scientists, decision makers, health professionals and civic organizations, as well as integrated international sharing experiences for all stakeholders. Since many countries are struggling with the same problems and considering the comment from one interview saying that working 'success cases' is one of the most powerful facilitators of eHealth development, it is important to learn from a wider pool than from one country, and also to actively test ones' solutions against the others.

Another aspect of this type of international measure is the promotion of cross-border cooperation, either by providing health services or integrating public services. With its accession to the EU, Estonia has shared a single space of mobility for citizens to travel, live and work. Such rights should be supported by eServices and thus availability of cross-border services of various purposes should be a priority. These rights should include for instance, the exchange of information about taxes paid by overseas workers. More advanced services such as cross-border acknowledgement of digital signatures should also be prioritized. Considering the Single European Market and the creation of pan-European, cross-border and multi-national eServices targeted at SMEs could likewise be effective and efficient.

The main goal of this policy is the rapid spread of valuable knowledge and experience, which is especially important for small countries like Estonia. Promoting cross-border care has positive effect on eHealth service development, but it works also *vice versa* by developing and testing internationally eHealth solutions, it is possible to make case for more intensive use of cross-border services.

Individual activities under this policy can vary in terms of their length, investment needs and return of investment. This means that this policy can potentially show certain results in a relatively short time with relatively low cost.

Public discourse on eGovernment and eHealth services

The objective of the following is to generate awareness as well as discuss the content of eServices developed to create more legitimacy among the society.

Several experts interviewed pointed out that there is lack of public discourse on eGovernment or eHealth services. A typical example is eVoting. There was hardly any accompanying discussion of eVoting in the media or in the society at large. Neither were there any significant public comments from social scientists or lawyers. The eVoting initiative came from the Estonian political elite that was and is largely detached from 'the people'. Although the situation has improved in the field of eVoting due to various advocacy events organised by the Estonian e-Governance Academy in 2006, the problem continues to exist.

The same issues despite its slow emergence in public discourse, are also found in the case of eHealth. Since there is no comprehensive communication strategy for eHealth, the discourse has been replaced by reactive outcries from individuals. Formal events such as seminars and conferences are too concentrated on the technical aspects about the new era of eServices, instead of weighing the risks and benefits of changing paradigms. With regard to health issues, the topics most frequently discussed include the responsibilities of individual and the society and the changing features of health services (which used to be exclusive only to doctors and their patients). The professionals, who are supposed to participate in common public debates, must include specialists in ethics, anthropology and public administration, lawyers and sociologists, and many others.

Taking advantage of mobile technologies

The objective of the following is to introduce mobile telephone-based value-added services of eGovernment and eHealth.

mGovernment services as mobile telephone-based value-added services could be complementary with eGovernment services, for example electronic information-based services such as notifications, complaints, suggestions, etc, and new forms of electronic participation such as mobile-based voting for gathering public opinions, etc. However, a specific barrier emerges here as most developers consider the Estonian market of 1.4 million inhabitants not big enough for services to break even. As Raul Vahisalu of EMT has noted: '*Considering the small size of the market, the life-cycle of different technologies, and their bigger-market-oriented pricing, service providers have to constantly struggle to earn back the investments made to the mobile services*' (Vahisalu 2001). Thus, if detailed analysis confirms that mServices are reasonable and cost-effective,[54] more funding should be allocated for the further introduction of such services. Such services could be of high relevance in rural municipalities where Internet is less used.[55] Central and local governments could even jointly operate platforms for such services.

mHealth services have a good potential to improve and add value to healthcare services in Estonia. There are several examples from around the world that use mobile phone in developing public health services into sophisticated telecare solutions. Thus far, there are very few mHealth services even at a

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[54] Some existing studies in Estonia seem to confirm this.

[55] A successful project *SMS-based Quality Feedback System of Dairy Cooperative E-Piim*, Estonia, seems to support this. A commercial association E-Piim is a dairy co-operative owned by Estonian milk producers. Milk is collected from 500 producers and processed into cheese, milk powder and butter. In order to provide quality assurance and take advantage of widely spread mobile telephone, E-Piim launched an SMS-based milk quality feedback system in 2002. After the quality of milk has been checked by e-Piim, a milk producer receives immediate feedback via SMS and/or e-mail. SMS content generated by client software is forwarded to EMT service centre using UCP/EMI over the secure channel on the Internet. Prompt feedback enables the producer to implement immediate changes in the production system. This solution has generated a remarkable increase in the quality of raw milk. See Kalvet 2005 for more details.

pilot phase in Estonia, but the increase in number and spread of mobile phones and the large interest of telecommunication companies create a solid ground for possible success if people and sufficient resources will meet for this purpose. As mentioned earlier, the first step to enable quick advancement is to look at existing solutions abroad.

V: MAJOR TECHNICAL AND NON-TECHNICAL R&D CHALLENGES

Which co-ordination model?

The Estonian analysis shows that co-ordination of eGovernment and eHealth across different functions, levels and sectors remains an unsolved issue. More co-ordination can be achieved by hierarchy, network, or market. Next to the classical 'exercise of authority from the top' approach there is a network model that is based on solidarity, voluntary co-operation within a network, but assumes that objectives are widely shared among all network members. New Public Management reforms advocate for market-based mechanism.

The best model for the co-ordination of Estonian eGovernment and eHealth is yet to be identified and would require further research. But as objectives in the Estonian public administration are not really shared, network-based model would not work. Or, should one focus on building a shared vision in the civil service and market players, instead of choosing between hierarchies and market. According to Castells and Himanen (2002), this shared vision is central to the successful Finnish model.

Benefit of eHealth

Technological advances tend to increase overall costs of health services by offering opportunities not previously available in treating a particular illness. While cost-effectiveness of any new drug has been rigorously studied, it is only recently that evidence supporting the true benefits of specific eHealth solutions has become available (e.g., Stroetmann et al. 2006). At the same time, more intensive ICT use is often justified with the argument of cost containment and increased efficiency. This must be proven beyond a general remark, and more at the level of specific solution.

Cost-effectiveness is not the only criterion in identifying the benefits of an eHealth solution. Depending on the values and goals defined by countries or users, the benefit of eHealth solutions should be benchmarked on quality of care, increased solidarity, consumer and staff satisfaction, etc. Any major changes will affect the whole population. Thus, will eHealth improve access and responsiveness for the vulnerable and marginalised groups if the gains are distributed fairly or if the solidarity of health system (a universal value accepted today) will be maintained or even increased? If the answers to this question are not explicit, which most probably are not, the policies drawn for eHealth development should therefore address this concern.

Due to complicated financial arrangements in health systems it is not always clear who accrues the benefits from savings. If the cost and benefits are not balanced for respective stakeholders within the system, it may become one of the major obstacles in implementing even potentially useful eHealth services. The research and policy analysis has to be context-specific in order to reveal the feasible options for implementation and further development of eHealth services.

Reforms in healthcare are on the agenda in most of the countries, even if the general direction of reforms cannot be defined. Though measures are often in the opposite direction (e.g., centralisation *vs* privatisation) the general goals are similar – improved quality, efficiency or access. While this report does not deal with the true and reasonable definition of goals for structural reforms in healthcare, it can be said that the needed reforms must take place regardless of the application of eHealth, and smart use of technologies can facilitate the reform process. The role of eHealth in fostering or even enabling the achievement of certain health sector reform goals is a serious issue for research. eHealth must be studied in the context of buzzwords such as 'integration of care' and 'de-institutionalisation of care'.

Finally, the development of suitable indicators for respective researches in eHealth as described above is truly needed.

eVoting

One of the most controversial eServices implemented in Estonia is related to eVoting (as Internet-based voting). It appears that Estonia is the only country in the European Union with an eVoting law for national elections actually in place. Estonia was the first country in the world to enable its citizens nationwide to vote over the Internet for political elections (local elections of 16 October 2005), using ID-card based system which allowed citizens to sign their ballots electronically via the Internet.

Several problems require further research. At first, security remains an issue. All reports dealing with eVoting solutions point to this issue, and there are reports that suggest cancelling any experiments related to Internet-based voting due to unsolved security issues. Estonian ID-card based public key infrastructure is certainly exceptional and several security risks are thus marginal, but further research might be needed. Also, further research and development is needed to make the current ID-card software more user-friendly.

Doubts remain on whether such socially sensitive solutions should be implemented further, and whether the criticism on the implementation of eVoting in Estonia on the basis of its collision with the constitutional principles of secrecy, generality, and uniformity and possible technical problems and dangers is material and valid (see Drechsler and Madise, 2004)

Digital divide

The term 'digital divide' refers to one of the dangers brought about by the emergence of the ICT paradigm. It is understood as the gap between individuals, households, businesses, and geographic areas at different socioeconomic levels with regard to both their opportunities to access information and communications technologies and their use of the Internet (OECD, 2001: 5). In the context of the ICT paradigm, it refers to a situation in which part of the population is excluded from further economic and social development and well-being due to ICTs. Digital divide, by nature, is a complicated question, and especially because it involves economic, social and other issues.

A research conducted in 2002 identified that motivational barrier, which refers to the perception that the possibilities offered by the Internet are not associated with personal needs, was the main barrier to the Estonian society's further development of eServices. Among 'Blue Collars' for instance (see section 5 in Introduction), several other barriers were identified, namely: [a] social and psychological barriers (such as dread of new technologies, no recognition of the need for lifelong learning, and a fear to reveal to other people one's lack of skills); [b] skills barriers (lack of computer and foreign language skills); and [c] economic barriers (income per family member is at the Estonian average level). However, several policy measures have been implemented since said research was conducted, and the situation has probably changed a lot. New researches and policy analyses would provide additional insights about the barriers identified earlier, and thus help to design additional, updated policy measures.

Social and ethical aspects of health

Socio-cultural aspects affecting eHealth usability and the impact of its intensive use on traditional principles of health service provision are not very well known. This is due to very recent history of the phenomenon. While risk management is the prevailing paradigm in modern sociology, the risks, if any, of intensive use of ICT is yet to be known. The notion of uncertainty is widely accepted as eServices have the potential to change many traditional practices in the society. Research can then provide answers to issues and factors that affect usability and adaptation to eServices.

Another aspect that needs more understanding relates to the bioethical aspects of rapid and wide use of eHealth. Some have speculated for the loss of trust between patients and doctors, fetishism of stored information. Additional problems may arise if privately shared individual health data will be

simultaneously used for administrative purposes by policy-makers, who at the same time advocate for increased individual responsibility. Will one's history of smoking or otherwise irresponsible health behaviour be punished in the later years of life? A healthy scepticism will definitely favour the discourse and more research addressing these questions is a must.

Benchmarking, best practice, and lesson-drawing

Estonia is considered successful in the implementation of eGovernment solutions. Yet, the slowing down of developments in recent years urges for an analysis of the experiences of other countries and hence for lesson-drawing (which has already been done beneficially in the field of mServices). Considering other countries' success in eHealth, identifying transferable practices is needed. From another perspective, Estonia's success in eGovernance has brought up discussions in many countries about the transferability of the Estonian model to them. Two research challenges are related.

Cost-benefit analysis and evaluation of Estonian eGovernment and eHealth solutions is severely limited. This is partially due to unavailability of cost data, but also due to lack of knowledge in methodologies and lack of respective tradition in Estonia. Hence, more research and policy analysis in the field of evaluation and cost-benefit analysis are needed to investigate if ICT is used in an efficient and effective manner, and if ICT brings about more transparency and accountability, among others.

Different issues emerge in the case of technology transfer. Theoretical literature suggests to move beyond widespread and simplistic 'best practice' dissemination. It is well known in the innovation research that institutions like norms, habits, and rules matter (e.g., Lundvall 1992) and thus immediate policy transfer is impossible. 'Borrowing a program that is effective elsewhere is no guarantee of success' (Rose 1993: ix), and one should instead use benchmarking, best practice, and lessons learned. Future research should identify what best practices are transferable to and from Estonia. For instance, this report's preliminary analysis suggests that transferring the Estonian system of eGovernment is very problematic to countries where infrastructure is less advanced (especially in the case of eVoting). The same holds true with regard to the transferring of eGovernment to countries where there is less political support and/or information society topic gets 'owned' by just one political party. Further, the Estonian ID card and PKI infrastructure for example could not be replicated in countries that do not issue mandatory ID cards, and whose citizens lack the trust required for their implementation. All these context-specific issues matter and should be researched further.

The initial success of Estonia in eHealth has been followed by less rapid development, and it is only until recently that an ambitious plan for national health information system with universal coverage has been initiated. Similar plans are active in most of the countries, though the approaches chosen to reach the goal are quite different. Given the fact that ICT-projects are quite costly and many of them fail, makes it reasonable to consider and learn from earlier experiences. Thus, the policy question that should be addressed through R&D would be 'what works and what does not work, and why?'

This type of knowledge can be obtained through a systematic analysis of all aspects described in chapters III and IV. Though health systems (like any public system) are quite different between countries, their goals and intermediate targets are identical (World Health Report 2000). Thus, R&D on eHealth solutions has the highest potential to contribute to universal goals and be transferred. Cross-country and historical analysis of large-scale innovative solutions that have been successful in many countries may be a good starting point, as well as comparative analysis of different solutions for similar problems.

Integration and interoperability on international level

One of the policy recommendations identified above is the provision of eServices initially at the European level and later at the global level. The benefits are immense. First, people are travelling, and hence eHealth/eGovernment solutions are badly needed in case an unforeseen incident happens. Second, in a globalised world, activities of businesses are international; and better utilisations of respective public databases and acceptance of digital signatures can increase efficiency and effectiveness, as well as contribute to the emergence of a true information society all over the world.

To achieve this, a lot of political agreements need to be made, which, in turn, involves a whole range of pre-requisites. There are R&D challenges related both to technologies and to organisational models, and these challenges need to be tackled before any political discussions can be initiated.

Language technologies for *Ambient Intelligence*

As for the Estonian language, it is possible to get information on electronic glossaries and corpora, as well as in simple text processing aides such as spell-checkers and dividers. It is already possible using a computer to determine the form of a word or an element in a sentence, read out a prepared text, speed up the compilation of a dictionary and add grammatical information to a corpus.

As for the full emergence of advanced ICT solutions – *Ambient Intelligence* – achievement of more complex goals in language technologies is needed, including means and methods for automated processing of language material, both written texts and spoken, automatic speech recognition, machine translation programmes, etc.

Considering that the Estonian language environment is too small to evoke the interest of commercial companies in investing especially in products meant for the Estonian language, funding of R&D from public sources is important.

CONCLUSIONS

Since the 1990s, Estonia has had remarkable success in the promotion of a technology-based information society. Within a relatively short period, Internet usage has skyrocketed. E-services and m-services have found their way into the everyday lives of Estonians, improving their quality of life and the efficiency and effectiveness of the governance system. The share of Internet users among the population is relatively high and recent surveys by TNS Emor for 2006 indicate that 58% of people aged 15-74, or 60% of those aged 6-74, are Internet users. Estonian inhabitants are optimistic about the e-services offered by public authorities and private companies such as commercial banks.

Estonia is especially advanced in terms of the number and sophistication of **eGovernment** services. Such eServices have developed from simple one-way communication services to complex two-way solutions. The emergence of unique solutions includes Internet voting, which is one of the landmark accomplishments in eGovernment. Estonia is also in a relatively good position as regards eHealth services, but the effect of e-services at the systemic level is more modest. So far, information systems are mainly oriented towards financial management, but not medical information.

Major factors, which shaped the evolution of eGovernment and eHealth in Estonia include specific economic circumstances, the policy and regulatory framework, technological factors and competency, and socio-cultural factors. It is generally agreed that there are some social and cultural peculiarities in the Nordic countries (and Estonia) that caused the Internet boom. The general image of the use of ICT is very positive in the Estonian society. It is important to note that among EU and CEE candidate countries, Estonia is one of the countries with a low level of concern about data security and privacy/confidentiality.

The public sector has carried out two major (horizontal) projects that have made successful eGovernment possible. First, government information systems and databases have been connected to the Internet through a service known as the **'X-Road'.** Today, X-Road is the implementation of unified interfaces for different existing databases and a data exchange layer that allows officials, as well as legal entities and individuals, to work on data from national databases over the Internet within the limits of their authority.

Second, the **Estonian ID-card**, a compulsory identity document for all citizens which includes electronic authentication and authorization mechanisms, provides the foundation for several innovative e-services. For instance, the Estonian ID card makes it possible for all citizens to use digital signatures. Furthermore, the Estonian Parliament Electoral Law has implemented the use of eVoting at national level. Estonia is the only country in the European Union where eVoting for national elections is actually in place.

Regarding eHealth, early regulatory steps by the Government resulted in highly sophisticated eServices at institutional (provider) level. Such mandatory regulations include computer ownership and Internet access for family doctors and the systemic investments and strong contracting power of Estonian Health Insurance Fund, which is the primary funding agency. Health Insurance Fund has acted as a lighthouse for the providers and motivated them through its contracting policy to develop sophisticated ICT tools for financial management and data sharing. The positive attitude towards ICT usage has promoted the implementation of some effective eHealth pilot projects.

Some experts argue that Estonia is unable to keep pace with the rapid advancement in eGovernment. Others even consider that Estonia is falling behind and that **barriers to eGovernment** have not been properly addressed. There is relatively limited horizontal focus in the implementation of information systems due to coordination problems and the current financing mechanisms. For instance, there is no clear overview of actual IT-related expenses, making it difficult to perform cost-benefit analysis, which could demonstrate the effectiveness of such services. Further, while local governments are well equipped with ICT tools, the extent to which eServices are offered by local governments is limited.

The capacity to strategically develop information systems is also lacking at local level. Although favourable eGovernment legislation is present, improvements should be made to guarantee its implementation.

The development and implementation of an eHealth system has been relatively modest since 2003. The rapid start-up was not followed by a widespread implementation which would have allowed the system to reach its full potential. There are **several barriers in eHealth** including the limited co-ordinating role of the central government, low R&D capacity and limited awareness of available solutions, limited investment, and lack of inter-operability mechanisms, among others.

A challenge to both fields is the **limited availability of skilled ICT personnel.**

It is proposed that concrete policy measures with detailed timescales and division of responsibilities, impact and risk assessments as well as success indicators, be developed.

Strengthening central co-ordination is important as ICT issues are inter-organisational and need backing from the top management of various organisations to achieve genuine integration of ICT into respective domains (i.e., a holistic approach to governance: interconnection of technological, organisational and legislative, etc aspects).

A related issue is the improvement of funding mechanism. There is currently no clear overview of ICT costs which puts constraints on **priority funding** of important horizontal eGovernment projects. Although the principle of subsidiarity is important in public administration, there are some horizontally relevant projects in which many organisations should participate and the interests of one should be subjugated to the interests of the state as a whole.

Systematic funding of innovation in healthcare, including eService development, should take primary consideration. Systematic and stronger financing of eHealth implementation should be pursued to improve health service provision with the help of ICT. Within the service delivery process, financial and regulatory incentives should be provided in order to promote increased innovation and eService development.

Enhanced co-operation between central and local governments is necessary to ensure the link between the state-of-the-art Estonian central information systems and the relatively weak ICT-capacity at local level. It is crucial to **develop the information systems and eServices of local governments.**

To overcome the general complexity and inertia of the healthcare system, **small-scale and well-targeted applications** should be implemented, which could later serve as models for the scaling-up of similar projects. In the same manner, broader structural reforms should be carried out to enable improved business processes for eServices and increase motivation to invest in eHealth. Both legal and financial foundations should support this.

Although Estonia has often been reported to be a country with a favourable legislative environment for ICT, it is crucial that this environment be further **improved and implemented**. The legal framework for eHealth should veer away from the current conservative/narrow paradigm favouring individual rights over efficient information use.

The ICT education system should also consider revising the curricula so that they are more inter-disciplinary, adding more practical tasks and projects performed in groups, where ICT students can be introduced to the specificities of public administration and health informatics. For eHealth broad, interdisciplinary cooperation should be promoted and health/medical informatics must be developed as a discipline at educational and academic levels to train the next generation of users, and sustain initiatives in these aspects.

Some of the issues raised are not easy to answer. Policy analysis methods might not be enough and research and development may be needed.

This study shows that several issues pertaining to the coordination of eGovernment and eHealth across different functions, levels and sectors remain. To achieve more and better coordination, the hierarchy, network, or market approach may be explored. However, the best model/theory that could provide or establish better coordination between Estonian eGovernment and eHealth has yet to be determined.

One of the most controversial eServices implemented in Estonia is related to e-voting over the Internet. Several related problems require further research, including technological (e.g. security issues) and social issues (e.g. impact on democracy). Further research on social aspects should also include issues related to digital divide (how to overcome barriers related to the use of the ICT), bioethical aspects, etc. As underinvestment in healthcare in Estonia has become chronic with no clear sign of immediate improvement, the issue of cost-effectiveness becomes very relevant for major eHealth service development.

As regards the full emergence of advanced ICT solutions, namely *Ambient Intelligence,* achievement of more complex goals in **language technologies** is needed.

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Abstract

In 2005, IPTS launched a project which aimed to assess the developments in eGoverment, eHealth and eLearning in the 10 New Member States at national, and at cross-country level. At that time, the 10 New Member States were Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovenia and Slovakia. A report for each country was produced, describing its government and health systems and the role played by eGovernment and eHealth within these systems. Each report then analyzes, on the basis of desk research and expert interviews, the major achievements, shortcomings, drivers and barriers in the development of eGovernment and eHealth in one of the countries in question. This analysis provides the basis for the identification and discussion of national policy options to address the major challenges and to suggest R&D issues relevant to the needs of each country – in this case, Estonia.

In addition to national monographs, the project has delivered a synthesis report, which offers an integrated view of the developments of each application domain in the New Member States. Furthermore, a prospective report looking across and beyond the development of the eGoverment, eHealth and eLearning areas has been developed to summarize policy challenges and options for the development of eServices and the Information Society towards the goals of Lisbon and i2010.

The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.