Department of State Information Systems

INFORMATION TECHNOLOGY IN PUBLIC ADMINISTRATION OF ESTONIA
YEARBOOK 2005

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PREFACE

Dear reader,

This book is about people. Do not get confused by sophisticated terminology or discussions about technology you may come across with when reading this yearbook. Information and communication technologies offer wonderful possibilities for creating a better life for people. I sincerely hope that despite of the growing internal complexity of technical solutions, citizens - our customers - will feel that they can manage their everyday business in an easier and more convenient manner.

It has to be kept in mind that society as a whole can benefit from the use of ICT if conditions to participate in the information society are created for all. People are different, everybody leading his own life and doing his business, and we should not forget that some of them are also civil servants. Nowadays, ICT can offer a lot for the performance of these roles. Satisfied citizens, successful entrepreneurs and civil servants using wisely taxpayers' money – these are the ideas we would like you to dwell about when reading the following pages.

Enjoy reading!
EDGAR SAVISAAR
Minister of the Economic Affairs and Communication

IN RETROSPECT

In terms of information society, the year 2005 was a remarkable one – both at global and EU level as well as in Estonia.

In November 2005, the second phase of the World Summit on the Information Society was held in Tunis. The meeting clearly proved that Estonia has taken right steps on its way towards the information society. All the countries that gathered to the Tunis summit shared the opinion that schools should have Internet facilities, public sector information should be available over the Internet and that citizens should be provided with modern electronic communication channels to interact with the state.

An important phase was concluded also in Europe: as the eEurope Action Plan 2005 came to an end, a new EU-level policy framework - i2010 - was elaborated. The new policy sets targets for the development of the information society over the next five years. While the focus of the eEurope 2005 was primarily on the development of individual e-services and their underlying secure infrastructure, the new policy document goes beyond that. IT-based activities are approached from a wider perspective, taking into account their impact, for instance, on general economic growth, organisation of health care and ensuring traffic safety, to name a few fields. There is a growing understanding, both in the EU and in Estonia, that in order to gain success, bare use of technology will not be sufficient – real impact is only achieved if implementation of modern technologies is accompanied with the reorganisation of processes and continuous upgrading of skills. These principles have been taken into account also in drafting the Estonian Information Society Development Plan – a follow-up to the Estonian Information Policy that will come to a complete in 2006. The new policy document, which will be ready in the first half of 2006, does not only deal with the state information system, but envisages activities also for increasing the competitiveness of the ICT sector, widening the use of IT in the business sector and the general society, and for adapting to changes brought along by the introduction of new technologies.

The foundation laid for the development of information society in previous years (data exchange layer X-Road, ID card, public key infrastructure) serves as a good basis for the elaboration of new services. Launching new e-services has become quite a routine by now and it does not call for major investments or starting projects from scratch. The development of a legal environment favouring e-services and breaking administrative habits has often turned out more difficult than the elaboration of IT solutions. One common trend is the shift of focus from e-services that generate profits for the state (e.g. tax collection) to services channelling money towards the citizen (e.g. the e-service for obtaining parental benefits as well as several other social services).

The implementation of the eVoting project during the local government elections stood out as a fresh and new initiative in 2005. Although the issue of eVoting was surrounded by heated debates and various opinions, the IT itself functioned effectively. Once more, the existing developments – the public key infrastructure and the ID card – enabled to implement an innovative project cost-effectively, which would not have been possible under different circumstances.

The citizen has always perceived the state as an integral and the co-ordination of state information systems has pursued to follow this perception. However, the means and methods have changed with time. On one hand, we are in a situation where it is impossible to calculate how much of their budgets various authorities spend on e-activities, while on the

other hand, numerous new opportunities have arisen. In 2005, resources of EU structural funds became available for information society projects in Estonia. Getting used to this funding system will inevitably take time and naturally everything does not always turn out as expected, but the emergence of a funding mechanism for developing an information society that does not have to rely on the budgets of institutions is most welcome.

Information technology provides us with many new opportunities to better organise our life, but at the same time, it should be kept in mind that there are also new risks to these novel opportunities. IT security is one of such issues that call for vigilance. The common understanding in Estonia is that single measures are insufficient to ensure a secure eState – the potential issues of concern should be approached systemically, i.e. avoiding risks as well as dealing with consequences. There is still a lot to be done in the coming years in order to implement a common and productive IT security policy.

The Estonian information society has reached a point where it is difficult to produce extraordinary results individually. Further progress requires contribution from all parties – stage agencies, the private sector and citizens – to help the state implement valuable IT solutions.

Ivar Tallo, Director of eGA welcomes Mr.Savisaar to the WSIS Convetion in Tunis.

CONTENTS:

1. DEVELOPMENTS AT THE POLICY-FORMULATION LEVEL

1.1 INFORMATION POLICY ACTION PLAN 2006

The basic policy document in the field of information society in Estonia is the „Principles of the Estonian Information Policy", the current version of which is coming to an end in 2006. Thus, a new strategy that takes into account also the objectives and priorities of the EU information strategy i2010 is currently being elaborated by the Ministry of Economic Affairs and Communications.

The implementation of the Estonian information policy is based on annual information policy action plans, which set out concrete activities, responsible authorities, expected outputs, and evaluation of finances.

The priority fields of the information policy action plan 2006 are the following:

1. **Geoinformation systems**: development of geoinformation services so as to ensure their ease-of-use and to make digital cards available for all authorised users and other information systems.

   Responsible authority: Ministry of Environment

2. **Document management and digital archiving**: increasing the share of electronic document management and launching digital archiving in order to ensure faster, easier and more convenient management of public business.

   Responsible authority: State Chancellery

3. **Reorganisation of the population information system**: Pursuant to the Population Register Act, the register has to ensure the collection of main personal data of Estonian citizens and aliens, who have obtained residence permits in Estonia for the performance of functions of the state and local governments.

   Responsible authority: Ministry of Interior

4. **Administration system for the state information system (RIHA)**: development of a new administration system for the state information system. RIHA will be an integral system covering all components of the state information system, administrating their metadata, providing services, and performing, to the extent provided by legislation, the administrative function of support systems.

   Responsible authority: Ministry of Economic Affairs and Communications

5. **Development of social welfare information systems**: consolidating the performance of social welfare functions into an integral service-based system and improving, in co-operation with state agencies dealing with employment and health matters, the quality of service provision to citizens.

   Responsible authority: Ministry of Social Affairs

6. **ICT in education and research**: supporting the follow-up to the TigerLeap programme

and the Tiger University+ programme, the Estonian Grid project, the Estonian Research Information System project and the Estonian School Information System project.

Responsible authority: Ministry of Education and Research

7. **eInclusion and broadband strategy**: ensuring for all Estonian citizens benefits related to the use of computers and the internet, and increasing, thereby, Estonia's competitiveness and the creation of new jobs. This priority field mainly includes activities aimed at increasing the supply and availability of fast internet connections, while matters related to the demand-side are dealt with in other fields of the current action plan.

   Responsible authority: Ministry of Economic Affairs and Communications

8. **eProcurement**: digitising the whole public procurement process, beginning from tender notifications to signing of contracts.

   Responsible authority: Ministry of Finance

9. **Presentation layer for the state information system**: creation of a singe point of entry that would ensure standardised access to e-services provided by the public, the private and the third sector, and would lead to:

   - improved quality of service provision by uniform and centrally provided e-services;
   - increased efficiency in the public sector as a result of the re-use of similar functions and the elaboration of a framework suitable for the standardised presentation of e-services.

   Responsible authority: Ministry of Economic Affairs and Communications

10. **eSecurity**: development of a co-ordination mechanism for the management of IT security matters and organisation of respective co-operation. This priority field also includes awareness-raising activities in the field of IT security both for the public sector and for the whole society.

    Responsible authority: Ministry of Economic Affairs and Communications

11. **eBorder**: joining the Estonian border control information system with respective EU systems.

    Responsible authority: Ministry of Interior

12. **Co-ordination of the state IT policy and the respective EU co-operation**: ensuring that the co-ordination, implementation and monitoring of the priority fields set out in the action plan would be carried out in accordance with common principles.

    Responsible authority: Ministry of Economic Affairs and Communications

13. **Electronic legal protection** is a set of projects aimed at the development of e-services for citizens and the creation of an ICT working environment for law-enforcement authori-

ties in the jurisdiction of the Ministry of Justice and the Ministry of Interior.

Responsible authorities: Ministry of Justice, Ministry of Interior, Police Board

14. **Digitalisation of cultural heritage** is a project integrating several sub-projects that aim at the protection and preservation of the Estonia cultural heritage and rendering it accessible for all by means of modern IT solutions.

    Responsible authority: Ministry of Culture

15. **eHealthcare**: development of an intelligent patient-centred environment and creation of e-services that would enable the collection, processing and preserving of health-related information irrespectively of an individual's location, time etc.

    Responsible authority: Ministry of Social Affairs

16. **Environmental Register**: integration of environmental data into the register to an extent provided by legislation, updating the Environmental Register Act and ensuring the functioning of databases necessary for data exchange.

    Responsible authority: Ministry of Environment.

1.2 STATE IT INTEROPERABILITY FRAMEWORK

IT interoperability framework – what, why and to whom?

The responsibility for the co-ordination of state information systems in Estonia is assigned to the Ministry of Economic Affairs and Communications. The Estonian information policy, called „The Principles of the Estonian Information Policy 2004-2006" set out the main principles, priorities and objectives for developing information society in the coming years. The State Interoperability Framework and the related documents, elaborated at the initiative of the ministry and now available at http://www.riso.ee/infopoliitika/koosvoime/, serve as a continuation to the state information policy. The documents describe how to integrate public sector information systems into a single logical whole serving the population and different organisations and how they contribute, together with private sector information systems, to the reorganisation of public administration management in the information society.

During the last couple of years, public key infrastructure (PKI) has been built and several user-oriented portals, such as http://www.riik.ee, http://www.eesti.ee, https://www.eesti.ee, have been developed in Estonia. In addition, data exchange layer called X-Road has been created. The IT interoperability framework generalizes and gives a systematic overview of the positive developments of state information systems.

In order to implement the interoperability framework, the state has to be citizen-centred and its information systems must be service-based. Besides, as a member state of the European Union (EU), Estonia has to ensure interoperability of its information systems with those of other member sates. Though the functioning of state information systems is targeted at achieving the same rationality as applied to private sector information systems, sharp differences between the state and the private sector remain. It is not the state's aim to "sell" services, but to ensure their expediency. It is presumed that in the nearest future, information systems will enable to perform several operations from one and the same place, e.g. service users will no longer have to visit officials and search for websites. The efficiency of public sector information systems cannot be measured by same indicators as those of the private sector (return on investment). In terms of integrated service provision, public sector information systems have to serve as pathfinders for private sector information systems. Participation in the development of state information systems through public procurement and meeting the needs of the state as a whole poses a considerable challenge for the Estonian IT sector.

Everybody must have the possibility to participate in the developing information society. Official-oriented information systems will be replaced with citizen-centred and service-based ones. It is the state's task to develop a secure IT environment that would take into account everybody's needs. An individualised IT environment takes into consideration whether the user is a citizen, an entrepreneur, a representative of the third sector or an official, and ensures a common secure access to all pubic sector services for all.

The IT interoperability framework and the related documents are obligatory in order to ensure mutual communication between the information systems of central and local government agencies. The framework documents cannot, however, be regarded as legislation. The obligatory nature of the framework is expressed through the following aspects:

- The framework and the related documents have gone through a consultation period

during which central and local government agencies, the private sector, third sector organisations, as well as private persons could submit their proposals. Thus, the following the principles of the framework is obligatory for them as an agreement between different stakeholders.

- Pursuant to the Government of the Republic Act, the Act on the Data-bases of the State Information System (draft), and "The Principles of the Estonian Information Policy", co-ordination of the development of state information systems is assigned to the Ministry of Economic Affairs and Communications. The interoperability framework and the related documents are the basic documents of the state information system.

The following documents have been taken into account when drafting the Estonian IT framework:

- political decisions and legislation of the Republic of Estonia;
- "The Principles of the Estonian Information Policy 2004-2006", approved by the Government of Estonia;
- the EU Interoperability Framework and the related documents.

The Estonian IT interoperability framzework serves as:

- a guidance for those elaborating concepts for country-wide information systems;
- a guidance for IT project managers in the public administration for elaborating concepts for the information systems of their institutions;
- an aid for organising public procurements.

The aim of the IT interoperability framework is to increase public sector efficiency in Estonia by improving the quality of services provided to citizens and enterprises both at national and the EU level. The specific objectives of the framework are the following:

- to facilitate and, consequently, implement the transformation of institution-based public administration into a service-centred one, where all citizens can communicate with the state without knowing anything about its hierarchical structure and division of roles;
- to reduce public sector IT expenses through a wide use of centrally developed solutions;
- to improve the interoperability of new IT projects through co-ordinated use of centrally developed infrastructure, middleware (public key infrastructure (PKI), data exchange layer X-Road, citizen's environment etc.) and open standards;
- to improve the co-ordination and management of state information systems and to accelerate the development of IT solutions;
- to contribute to the co-development of the state information system;
- to allow autonomous development for all systems within the principles of organisa-

tional, semantic and technical interoperability;

- to ensure free competition in the area of public procurement.

The framework does not attempt to provide clear solutions to all IT-related problems in the state. The transformation from the institution-based world to a service-centred and citizen-oriented one is a longer process, necessitating changes in the legislation and in the organisation of public administration activities. Activities that do not require creative intellectual work by human beings should be detached from the typical activities of the public sector. The current version of the framework does not aim at describing new ways of governance that the development of information society brings along, but seeks to determine the rules, trends and principles necessary for the development of such a society from the viewpoint of information systems.

Institutions are autonomous as to the IT architecture and interoperability principles within their internal information systems, but when launching new IT projects, central and local government institutions have to follow the principles of the interoperability framework.

The framework lists the components of the state information system, gives a brief overview of nation-wide information systems, as well as of aspects related to organisational interoperability. The framework comprises three documents: „State IT Interoperability Framework", „Estonia's IT Architecture" and „Strategy of Semantic Interoperability". The interoperability framework has been elaborated by experts of central and local government as well as those representing private and third sector organisations. The work of the expert group was led by the Department of State Information Systems of the Ministry of Economic Affairs and Communications together in co-operation with IT companies AS Cell Network, AS Mikrolink Eesti, OÜ Makato Eesti and OÜ Mindstone.

Key principles of the state IT interoperability

- 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.

General structure of the state information system

The state information system is regarded as a service-centred organisation, meaning that all operations performed by civil servants, entrepreneurs, citizens, as well as software are considered services. End users access services in a **common service space**. They are not interested in the organisation directly providing them the service, but in the service itself.

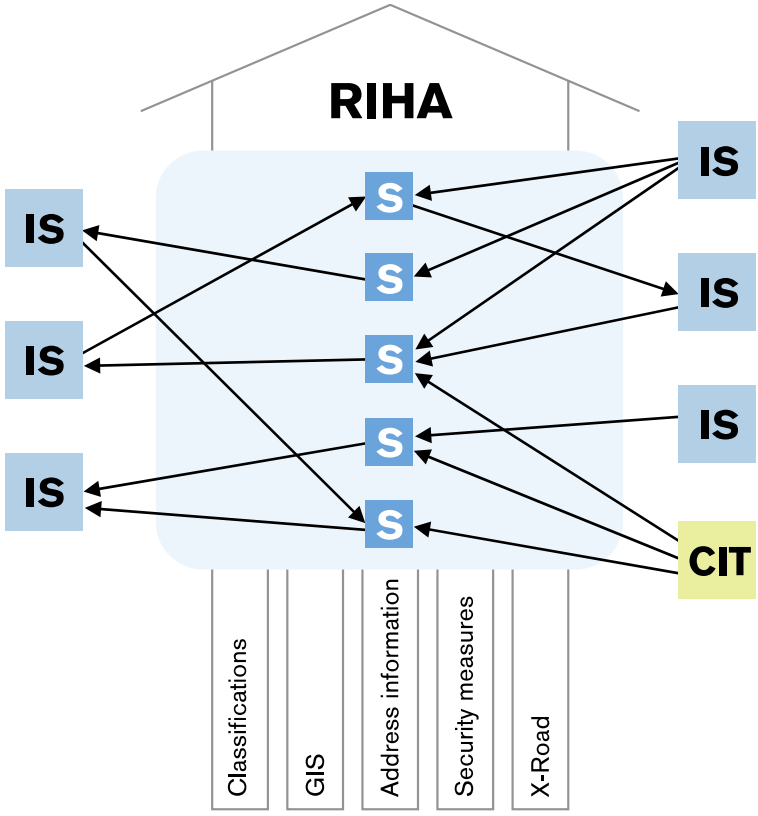


Figure 1. The state informzation system can be regarded as a service space, which is based on support systems and is administered through RIHA. Information systems communicate with each other via services (S – a service, IS – an information system, CIT – the citizen portal as a special guide to the information system).

Central and local government agencies, private companies, as well as third sector organisations all provide services.

Services are used by central and local government agencies, private companies, third sector organisations, and individuals. The common service space allows individuals to represent, when using public services, both themselves and the company they work for.

Services may or may not require authentication.

The logical components of the state information system are the following:

- information systems (both as service providers and service users);
- the administration system for the state information systems (RIHA) together with its services catalogue;
- the state-administered citizen IT environment;
- support systems and rules.

The support systems and rules for the maintenance of the state information system are the following:

- the classifications system;
- the system of address details;
- the data exchange layer for information systems (X-Road);
- the geodetic system;
- the system of security measures for information systems.

The classification system is a set of common principles for the administration and use of classifications. The system consists of:

- requirements for classifications;
- classifications;
- administrators of classifications;
- users of classifications;
- list of classifications and their administrators, classifications, services.

The system of address details is a set of principles, which allows a unified identification of address objects both in their physical location and in different databases. The system of address details consists of:

- databases, which process and handle address details;

- requirements for chief processors of address details, for respective services and for users;
- X-Road address services.

The data exchange layer of information systems – X-Road – is an environment enabling secure internet-based data exchange.

The geodetic system consists of:

- the geodetic reference system;
- the system of plane rectangular co-ordinates;
- the height system;
- the gravimetric system.

The security measures system for information systems consists of:

- the procedure for the specification of security measures;
- the organisational and technical standard measures for data protection.

Nation-wide information systems

There are two types of nation-wide information systems:

- Common single point of entries that operate in collaboration of state information systems. Users of public sector information systems are not interested in state information systems as such, but rather in the data maintained in them. State information systems have to co-operate and function as a whole for users.
- Support systems refer to agreements between state information systems as well as the respective middleware. As a rule, support systems do not have a meaning in itself. These systems ensure interoperability and re-use of resources.

The establishment and development of nation-wide information systems is co-ordinated by a government agency that has been vested with the responsibility for the co-ordination of the respective field. The responsibility for the functioning of these systems lies with an institution designated by the co-ordinating government agency or an enterprise from whom the agency has ordered the performance of the respective activity.

State domains and portals are administered by an institution responsible for the co-ordination of state information systems, while the use of these domains and portals is organised by an agency or a company designated by the co-ordinating agency. The agency organising the use of portals and domains owns computer resources for providing, if necessary, website hosting service for public sector institutions.

In developing state portals, recommendations of the Web Content Accessibility Guidelines

Working Group (WCAG WG) have to be followed (see http://www.w3.org/WAI/). Requirements for website content have been published at http://www.riik.ee/kord/ (only in Estonian).

In the public sector, institutional and thematic portals function as a whole in co-operation with state portals www.riik.ee and www.eesti.ee. In the development of these portals, the following principles have to be observed:

- the content of the portals is preferably XML-based and re-usable by any agency or person in any information system;
- for data exchange, XML format is used over http or https protocol;
- the XML format used is easily understandable and does not contain noise – unnecessary tags and details;
- the XML format used has to be documented in a manner understandable for developers;
- the presentation layer is realised as a separate application that communicates with the main application via XML texts and generates the HTML necessary for the user or realises the interface in some other way (WAP, SMS, desktop solutions etc.). Direct generation of an HTML text that does not support adaptable semantics from the main application should be avoided;
- portals should be designed so that content producers could use it in a database-based manner, while for ordinary users, they would be generated in a static way;
- portals are not re-designed unless there is a clear need to add functionality;
- the tables of contents and summaries of portals are presented, in addition to their visual design, also as RSS or RDF feeds. Standard-based interoperability has to be ensured between institutional/thematic portals and the citizen information portal http://www.eesti.ee and the eState portal http://www.riik.ee.

Interoperable document management systems

The interoperability of document management systems denotes the ability of these systems to mutually exchange and manage digital documents. Document management systems exchange information without any interim paper forms and regular post services. Into these systems have been integrated processes for the use of network services and for the processing of network services targeted at citizens and enterprises.

In order to achieve interoperability of document management systems in central and local government agencies the following activities are needed:

- Further development of X-Road so as to ensure document and data transport over the data exchange environment. All document management systems need to have an interface with the central document exchange point.

- The elaboration of XML-based descriptions of documents and their metadata for document compilation in document management systems.

- All public sector document management systems must be able to communicate with the citizen's IT environment: to receive applications from citizens and entrepreneurs and to respond to them.

The responsibility for the interoperability of document management systems is assigned to the State Chancellery together with the National Archives of Estonia.

Interoperable geoinformation systems (GIS)

The interoperability of geoinformation systems means that geoinformation services are easy to use and digital maps are accessible for all authorized users and for other information systems.

The interoperability of public sector geoinformation systems has to be based on principles of open standards:

- preconditions have to be ensured for the usability of digital maps and spatial data together with data layers that are significant either from local or administrative viewpoint;

- all agencies, enterprises and citizens must have the possibility to use digital maps that have been developed by the public sector and are based on open GIS standards;

- it must be possible, without any significant additional costs, to exploit new geoinformation data sources, provide new e-services through open interfaces, and add to the existing e-services links to geoinformation services;

- authorized use of data has to be ensured (e.g. objects falling into the Category I of nature conservation are only accessible for authorized users).

A simple search mechanism has to be ensured for finding information about the availability of spatial data and maps, their accessibility, possibilities of use, as well as about conditions for their acquisition or use – a catalogue service must be developed about the availability of spatial data and possibilities of different map applications.

According to the trans-European initiative INSPIRE (http://www.ec-gis.org/inspire/), which aims at the creation of a spatial information structure for the European communities, new data sources have to be added to the interoperable system of service providers. In the development of regional geoinformation systems, principles of open GIS standards have to be followed.

The responsibility for the interoperability of geoinformation systems lies with the Ministry of Environment, which:

- develops a map interface to the X-Road;

- exploits, by using IT tools that are based on open standards, basic maps developed

by the Land Board;

- in co-operation with other relevant agencies develops tools for the implementation of new spatial data layers.

Principles of organisational interoperability

Organisational interoperability is based on the following principles:

- All interoperable institutions are autonomous organisations with a specific technological architecture.
- All connections between institutions are based on multilateral agreements; if possible, bilateral agreements are avoided.
- Private sector bodies and non-governmental organisations participating in the state interoperability framework own the information and/or data they create or obtain. Data in the state information system is owned by the state. Responsibility for the structure and content of data lies with an organisation administrating the respective data either as a chief or an authorised processor of data.
- In data exchange, legal restrictions as well as organisational capacities are taken into account.
- Interoperable institutions exchange information by user authorisation.

Each institution determines access restrictions within its own information system. The use of nested services is agreed on between institutions

Infrastructure requirements for the state IT interoperability

Infrastructure refers to hardware, software and network resources that support the mutual communication between people and organisations, access to information systems, and use of services.

The basic principles of the development and maintenance of infrastructure are the following:

- The primary responsibility for the development, application and maintenance of the state information infrastructure lies with the private sector.
- In maintaining its infrastructure, the public sector proceeds from the principle of subsidiarity, according to which all state agencies are responsible for the development of the infrastructure of their own information systems, while considering also the general principles of the state IT interoperability framework.
- The public sector encourages the private sector to invest and participate in the development and maintenance of state infrastructure.
- In the provision of infrastructure services, the state fosters and protects free competition.

- The state ensures free access to its infrastructure both for service providers and service users.
- The state information infrastructure forms a part of the global information infrastructure.

Centrally developed infrastructure

In order to ensure interoperability of public sector information systems, the public sector assumes responsibility for the development and maintenance of several infrastructure components. The responsibility for the co-ordination of these components is assigned to a ministry responsible for the co-ordination of state information systems, while infrastructure development is, as a general rule, outsourced from the private sector. The functioning of central infrastructure systems is ensured either by state agencies or by outsourcing respective services from the private sector. The use of central components is mandatory for public sector agencies. The central components are the following:

- the data exchange layer X-Road;
- the interoperability layer of geoinformation systems;
- the interoperability layer of document management systems;
- the infrastructure ensuring the interoperability of websites maintained by public sector agencies, the state portal www.riik.ee, as well as the domain riik.ee;
- the infrastructure ensuring the interoperability of thematic portals as well as the information portal www.eesti.ee;
- the layer of interoperable personalised portals (citizen portal(s), entrepreneur portal(s), civil servant(s) portals);
- the system of classifications;
- the system of address details;
- the administrative system for the state information system;
- the security system;
- the geodetic system.

Central consolidation

In developing their infrastructure, public sector agencies co-operate with each other. Use of infrastructure components acquired through central consolidation is not obligatory for them. Partial central support is given to the following activities:

- joint procurements of software licences;
- consolidated purchasing of external internet connections and the development of back-

- bone network for state agencies (partly usable also by local governments);
- limited web hosting of domains riik.ee, gov.ee, eesti.ee and estonia.ee

Infrastructure outsourced from the private sector

In the acquisition of infrastructure, public sector agencies have to co-operate with each other. Assistance for the development of their infrastructure can be obtained from the Estonian Informatics Centre under the administration of the Ministry of Economic Affairs. Private sector services are used for the following components of infrastructure:

- Acquisition of software. State agencies are encouraged to co-operate in software acquisition.
- Acquisition of system software. State agencies are encouraged to co-operate in the acquisition of software systems.
- Development of services related to public key infrastructure.
- Establishment of development environments. Public sector agencies should not develop their own development tools or development environments. They are encouraged to co-operate with each other in order to ensure their interoperability.
- Hosting services. Public sector agencies are encouraged to co-operate in the outsourcing of hosting services from the private sector.
- Back-up services. Public sector agencies are encouraged to co-operate in outsourcing back-up services from the private sector.

The division of roles in the development of state infrastructure is as follows:

- the state plans the general development of IT systems, establishes requirements with regard to IT systems for state agencies, co-ordinates co-operation between state agencies in the field of IT systems, and performs the role of the supervisor;
- private companies design specific objects or IT systems and provide consultancy for state IT specialists;
- private companies carry out state's orders, and develop and maintain the state infrastructure, while the state is not the owner of the technology necessary for the functioning of the components of its infrastructure.

Technical interoperability and architecture

In the elaboration of the state IT architecture, principles of Service Oriented Architecture (SOA) have to be followed.

In case of service oriented architecture, different systems provide diverse information services through the so-called "service interfaces", which can be used by other information systems. Descriptions of these interfaces have to contain sufficient information for the identification

and use of a service without the need for the service-using system to "know" anything about the internal architecture, platform etc. of the service-providing system.

In case of SOA, the service publisher and the actual service provider do not necessarily have to be the same, while from the point of view of the service user, this does not make any difference.

There are no restrictions as to technologies to be used for the application of SOA.

The cornerstones of the state IT architecture are the following:

- technical interoperability,
- security,
- openness,
- flexibility, and
- scalability.

The efficient functioning of state agencies as well as the provision of quality services for citizens presumes the availability of high-quality information. Information is created as a result of certain events in the course of certain processes and it is preserved in state registers and information systems.

There are hundreds of information systems and registers in the state. According to one of the basic principles of the information society, information that has been created in state information systems has to be freely available for all authorised persons in order to ensure free flow of information. Information may be needed by citizens, agencies and entrepreneurs alike.

The state IT architecture must meet the following objectives:

Preservation of data in one place

Data are preserved only in a database, where they serve as basic data. Availability requirements may lead to the copying of data, but in this case it has to be taken into account that data may be outdated.

Linking business processes via nested services

Information systems communicate with each other via nested services. If for the performance of a business process in one agency data is needed from or workflow has to be carried out in another agency, nested services are made use of. Agencies must ensure that the data and services they offer could be used as nested services. For instance, one should avoid a situation, where a document is printed out in one agency, delivered to another agency by post, and then once again scanned into the computer.

Ensuring the availability of nested services

In situations, where service user's requirements for the availability of a service are stricter than those of the service provider, the latter should increase service availability. In case this proves impossible, other solutions can be considered while taking into account legal aspects.

Avoiding "single point of failure"

Solutions, where the break-down of one part of the system may disrupt the functioning of the whole system, are to be avoided.

Security

Solutions used in the state information system have to be secure and ensure confidentiality, authenticity, availability and provability of data.

Open standards

When choosing IT solutions, those based on open standards have to be given preference.

Person's right to access data about himself

Each person has the right to access data that has been collected about him to information systems. In addition, everybody should be entitled to obtain information about inquiries made by other persons about them unless this has been restricted by law.

Single-point entry to services

Central and local government agencies co-operate in order to ensure that citizens, officials and entrepreneurs could obtain all the information and services they need from the following state central portals: http://www.riik.ee, http://www.eesti.ee and https://www.eesti.ee.

It is the state's task to ensure the availability of high-quality information and guarantee the existence of a data exchange environment enabling access to information.

It is not expedient for the state to fix a detailed architecture for the state information system. The general architecture of and requirements for nationwide information systems have been fixed in the document called "The Estonian IT Architecture", which forms a part of the state's interoperability framework.

Definition of semantic interoperability

Semantic interoperability refers to the capability of information systems to adequately use data received from other information systems. Semantic interoperability is complicated by the fact that the use of software systems, their objectives, as well as contexts differ, leading thus to differences in ways of presentation, coding and shades of meaning.

Semantic interoperability cannot be achieved by establishing similar requirements and standards for all software systems, as this would be neither realistic nor reasonable. Achieving semantic interoperability should be approached as a task to facilitate the work of software engineers and developers, who have to build interfaces with other software systems.

Reaching semantic interoperability is, to a great extent, a matter of organisational, social and educational nature: first of all, support is needed for system specialists in order to better understand each other's fields of activities, to compile sound documentation of data structures and protocols, and to facilitate the search for such documentation.

In order to publish data stored in them, information systems use various tools, beginning from languages, dictionaries, classifications, and rules until complex ontologies. Similarly to software and hardware of an information system, we can also speak of its semantic assets.

Semantic interoperability assets

The semantic interoperability assets are divided into syntactic assets and semantic assets. In order to ensure semantic interoperability between two information systems, a semantic gateway has to be established between them. Semantic gateway has to ensure semantic alterations leading to adequate use of each other's data between information systems. The semantic gateway of a state information system is a set of multilateral agreements and rules that facilitates the mutual linking of systems on the semantic level.

Syntactic interoperability assets include XML schemas, metadata schemas, and core components. Principles need to be fixed on state level for the publication of data-schemas and for the definitions of metadata. The syntactic level of interoperability is the first stage in achieving semantic interoperability and it can be achieved by creating repositories for XML schemas.

Semantic assets of semantic interoperability denote information resources that have been created in order to ensure the interoperability of information systems. Semantic assets of semantic interoperability are divided as follows (the division is based on the IDABC working paper "IDABC Content Interoperability Strategy"):

- dictionaries,
- thesauri,
- nomenclatures,
- taxonomies,
- mapping tables,
- ontologies, and
- service registers.

Organisation responsible for ensuring semantic interoperability

Semantic interoperability depends primarily on high-quality documentation of databases, services, applications and areas. The main objective of an organisation ensuring semantic interoperability is to co-ordinate the development and regular updating of such documentation. Semantic interoperability can be improved by elaboration of standards, dictionaries, thesauri and nomenclatures. At the same time, references to these semantic assets can be made in the legislation; if necessary, their use can be made mandatory.

The development of an organisation responsible for ensuring semantic interoperability of the state information system should be based on the following principles:

- The role of the central co-ordinator should be assigned to the State Information Systems Department of the Ministry of Economic Affairs and Communications of Estonia and a semantic interoperability architect should be included in its personnel.

- In all major areas expert groups should be formed with a task of drawing up, upgrading and changing the documentation of the respective sector. Since these major areas more or less coincide with the fields of administrations of ministries, it would be expedient to establish expert groups in all ministries, assigning them the task of compiling and maintaining respective dictionary-documents.

- In case mutual agreements will not be sufficient for achieving semantic interoperability, cross-sectoral working groups should be formed. The aim of such groups should be to create and maintain instructions on the translation/modification of data objects of one area into those of another area.

- On the international arena, Estonia would benefit from participation in the work of IDABC semantic interoperability working groups, which aim at elaborating mutual agreements and semantic gateways for the semantic interoperability between information systems of different countries. For the realisation of projects that aim at the creation of connections with information systems in another country, bilateral expert groups representing both parties will be established.

Architectural requirements for semantic interoperability

In planning the system architecture, the following guidelines should be taken into account in order to facilitate semantic interoperability:

- for data exchange, the XML format is used over http or https protocol;

- the XML format used should be easy to understand and should not contain excessive noise (unnecessary tags and details);

- the XML format used must be documented in a manner easily understandable for developers;

- the presentation layer should be realised as a separate application that communicates with the main application via XML texts and generates the HTML necessary for the user or realises the interface in some other way (WAP, SMS, desktop applications etc.);

- direct generation of an HTML text that does not support adaptable semantics from the main application has to be avoided.

1.3 DEVELOPMENTS IN THE FIELD OF DOCUMENT MANAGEMENT

The development of document management is the responsibility of the Records Management Department of the State Chancellery. Its main tasks include planning public sector document management and archiving, organising drafting of relevant legislation, and co-ordinating the development of document management in state agencies (incl. transition to electronic document management).

In order to better co-ordinate public sector document management, the Records Management Department of the State Chancellery established a co-operation network of records managers in spring 2004. The network aims to:

- enhance state agencies' knowledge of developments in document management; improve the general planning of document management developments in the public sector;
- facilitate the exchange of know-how, best practices and experiences; promote contacts and co-operation between document managers of state agencies.

The co-operation network supports the State Chancellery in drafting the public sector electronic document management strategy. The main objective of the strategy for the coming years is to ensure fast, simple and convenient document management in the public sector.

Within the framework of developing regulatory environment for the document management, the State Chancellery has drafted amendments to the uniform bases for the document management procedures. These amendments regulate digital signing and authentication. The integrated drafting of legislation on document management and archiving is planned for 2006-2007.

Proceeding from the Principles of the Estonian Information Policy 2004-2006, the information policy action plans for 2005 and 2006, and the Development Plan for Document Management and Archiving 2002–2005, the State Chancellery launched the electronic document exchange project in 2005. The project aims to create interfaces between the document management systems of ministries, ensure interoperability between their information systems, increase the share of electronic document management in ministries, and develop electronic document proceedings. As a result, the various document management systems of ministries will be able to exchange documents via the data exchange layer X-Road.

Preparations for the environment of electronic document exchange project

In order to enable electronic document exchange between ministries, interfaces have to be created between their document management systems. According to a survey carried out at the beginning of 2005, ministries use various types of document management software with different level of functionality and implementation.

The readiness of state agencies to launch electronic document exchange depends on the introduction of document management and digital signatures in these agencies.

In order to prepare the document management systems of ministries for electronic document

exchange, additional software developments need to be commissioned from software developers.

Electronic document exchange project

With the aim of defining the basic objective of the project and mapping the current situation, a survey was conducted in summer 2005. Based on data maintained in the document registers of ministries, the survey analysed the volume of all documents exchanged between state agencies, the share of electronic document management and the structure of metadata.

In order to ensure the interoperability of various document management systems, the following elements will be compiled, tested and implemented within the preparatory stage of the project:

- the standard list of metadata necessary for electronic document management and preservation of digital documents;
- common document template in XML format.

The development project will be carried out in two stages.

Stage 2005: pilot project, which foresees the development of an application for electronic document exchange between four ministries by creating interfaces between various document management systems and the introduction of this application in three ministries (Ministry of Internal Affairs, Ministry of Finance, and Ministry of Defence) using the document management software Postipoiss and in one state agency (State Chancellery) using a different software (GoPro).

Stage 2006: involvement of all ministries in electronic document management.

Both stages include respective awareness-raising activities and trainings for various target groups. As regards technological support for electronic document exchange, the Estonian Informatics Centre is planning to establish a document repository.

1.4 SUPPORT SYSTEMS FOR THE MAINTENANCE OF THE STATE INFORMATION SYSTEM

The support systems for the maintenance of the state information system unify the administration of databases and information systems and provide for more efficient data exchange. The implementation of support systems ensures the horizontal interoperability of information systems.

The support systems are the following:

- the classifications system;
- the system of security measures for information systems;
- the system of address details;
- the data exchange layer of information systems;
- the administration system of the state information system;
- the geodetic system.

The following gives an overview of the two support systems that underwent several changes and developments in 2005.

1.4.1 X-road as the main backbone of Estonian state information systems

The architecture of eGovernment in Estonia was developed in the framework of the X-Road project. The project was initially launched for linking Estonian state databases to 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.

The general architecture of the eGovernment is outlined in Figure 2. The main backbone of the eGovernment environment is the X-Road network of distributed and central servers. The eGovernment project itself started in parallel to the X-Road infrastructure project and the ID card and PKI projects were launched in parallel to the development of some back-office information systems. Of course, there was a set of information systems already developed before.

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 of time it would still be possible to restore past situations, e.g. who has used the service and when, as well as what kind of decisions have been made in a particular context.

In the eGovernment environment, information systems provide and also consume services. Estonian commercial banks (more precisely Hansapank, SEB Eesti Ühispank, Sampo Pank, Krediidipank and Nordea Pank) are playing three different roles in the eGovernment schema. First, they provide portals (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 bank facilities. The authentication mechanism provided by banks is considered as trustworthy as that based on the ID card and valid for using eGovernment services.

Second, some of the services are charged for and, therefore, a solution has been developed for paying these charges. At first, the citizen transfers money to the bank and right after the transfer the e-service will start automatically.

Third, the banks themselves are users of data and e-services and they are using this environment just like any other information system.

Figure 2 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 data transfer protocol currently used is SOAP. At the same time, the older XML RPC protocol is used as well.

The X-Road centre is actually the heart of the eGovernment environment as all central servers (central monitoring server, certification server, etc.) 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. The management group organises courses, seminars, and co-ordinates co-operation with the European Union. A new central register of databases was added to the X-Road centre at the beginning of 2005. On one hand, this register includes the description of all Estonian public sector registers and databases. On the other hand, the register gathers all descriptions of e-services in WSDL (Web Service Description Language) format, which enables to develop different automatic tools by using the library of e-services for automatic generation of new services on the basis of these descriptions. This provides a new opportunity for doing research and development projects in the near future.

The Estonian Certification Agency (CA) is responsible for the developments related to the ID card, digital signature, and other PKI infrastructure elements in Estonia. The ID card facilities are discussed below.

Direct communication between citizens and the eGovernment environment works over a set of communication portals: the Citizen Portal, the Entrepreneur Portal, and the Civil Servant Portal.

The **Citizen Portal** was developed three years ago and has been the main channel to mediate eGovernment services between the citizen and the government (www.eesti.ee). The portal started three years ago mediating services from Estonian databases. According to the law, every Estonian citizen has the right to know what kind of data the government has gathered about him or her.

At the beginning of 2005, the first services for the **Entrepreneur Portal** were started to be developed. Currently, the application for alcohol sales permit is the most popular one.

At present, the **Civil Servant Portal** is implemented as a Mini InfoSystem Portal (MISP). It is used in nearly 70 different central and local government agencies. All the portals are organised as information portals, which can be used as user manuals and service portals for eGovernment services.

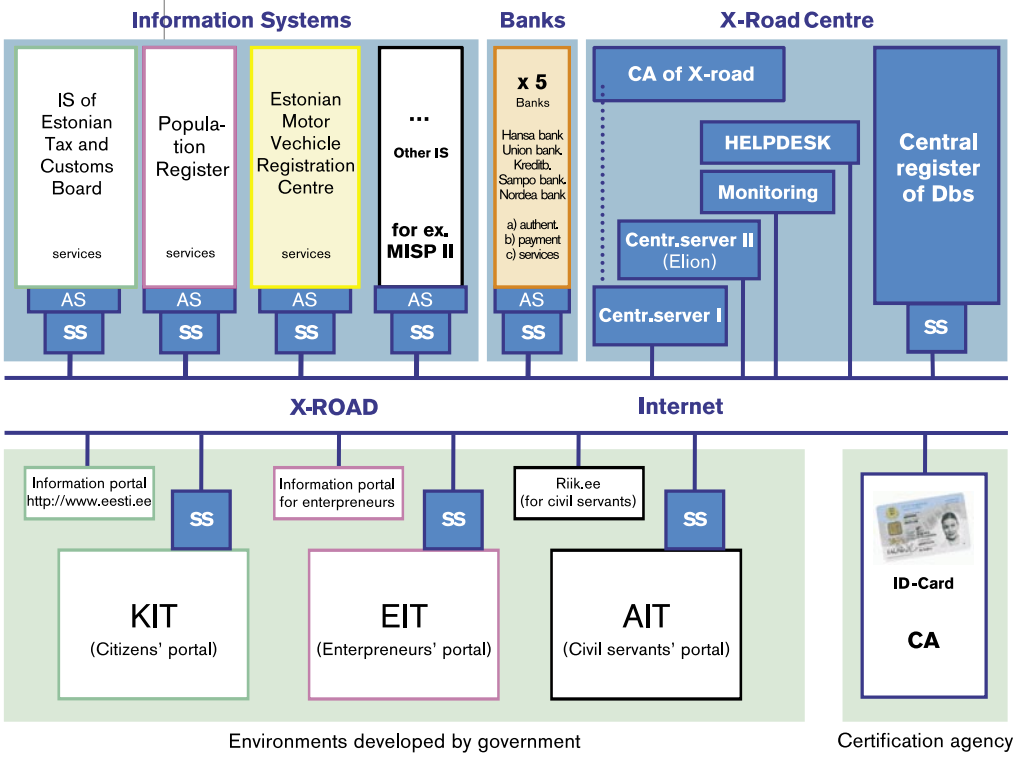


Figure 2. eGovernment architecture in Estonia.

New developments in 2005

The largest developments in 2005 were related to log processing. Since the introduction of the new basic version, the next generation security servers store and maintain logs mainly in encrypted form. For example logs of the Citizen Portal have a special solution. Anyone can see these logs by using the respective key of the ID card. However, if the key has been changed, it is no longer possible for anyone, including the key holder, to see these logs.

The year 2005 was the year of negotiations with various international projects and organisations. Discussions were held on using X-Road for the Schengen information system and eLink solutions of the IDA programme, as well as on launching pilot projects for data exchange with Swedish and Finnish population registers. X-Road is already now capable of authenticating all EU-25 citizens, as the code of the country whose citizen participates in the data exchange process was added to field of personal identification code in the data exchange protocol.

As X-Road is a secure data exchange layer, the secure inter-agency e-mail service was also developed on the basis of that. What is especially important here is that such e-mail is free of spam.

Development trends of X-Road

What new solutions in the X-Road structure could be expected in 2006? First, the monitoring software of the system needs to be improved because the one suitable two years ago for daily mode of operation with around thousand data transfers made via X-Road every day is not sufficient any more as the number of interactions has doubled or even tripled. Respectively, there are also more logs, error messages and other kind of usage information. At the same time, statistical queries should be separated from the functionality of the present monitoring process. These issues could be solved with the help of special statistics servers and/or data storages as has been done in banks' information systems. A similar technological solution is to be introduced also in the X-Road environment.

Furthermore, projects for creating interfaces with EU information systems and providing respective information systems with data from Estonian databases are on the agenda.

1.4.2 Administration system for the state information system

The administration system for the state information system (RIHA) is an improvement of the state register of databases (ARR). The objective of RIHA is to create a real integral information system that would give a clear view of the state's IT resources.

RIHA will be established as the sixth support system for the state information system (the five current support systems are the data exchange layer X-Road, the classifications system, the system of address details, the system of security measures, and the geodetic system).

The current state register of databases (ARR) administrates and provides access to information systems and databases of the state and local governments, and the metadata of data services offered by them. All state and local government agencies are obliged to register their information systems.

As the current register lacks efficiency, further developments are on the agenda. The objectives and functionality of RIHA should be much more extensive – in addition to the maintenance of records, it should also comprise metadata and information on all other processes taking place during the life cycle of an information system. This means gathering information throughout the life cycle from defining the need to create a system, deciding on its establishment, and organising procurement for developing, completing or reorganising the system.

The functionality of the current system will be increased so that RIHA would be able to present the state information system as a whole and give an up-to-date overview of the state's IT resources. Only this way there would be a clear picture of the already existing state information system components in various state institutions, the components still needed, and the available resources and options for their optimal use. It is important to provide all information system counterparties (spheres of competence) a respective view according to their role/responsibility and ensure an integral treatment of the key objects.

RIHA will be a tool for the system components themselves, i.e. a decision-making tool for information system administrators as well as for those responsible for the state IT co-ordination. Based on the data in RIHA, information system administrators will be able, for instance, to plan developments for their systems, and the state's IT co-ordinators will have the possibility to use the statistics to analyse and draft the state information policy action plan and develop-

ment strategies and make other kinds of decisions. Moreover, it will be possible to monitor the whole dataflow at government-to-government level as well as at government-to-citizen and government-to-business level. RIHA will enable to identify weaker links of the system and provide necessary solutions. The integrity of the state information system can be achieved only if its processes are transparent and can be monitored.

In order to ensure that RIHA would be an integral system, it should first be defined as clearly and explicitly as possible. Initially, the system has been defined in the concept of RIHA available at http://www.riik.ee/arr/kontseptsioon.htm (in Estonian only). The concept serves as an input for the further development plan for RIHA.

Although RIHA is currently under elaboration, the web-based registration service is already functioning – the application form based on the ID card is available at https://www.eesti.ee/arr (in Estonian only). Users are authenticated with the national ID card after which they submit a request for the registration in the information system. Requests are confirmed and access for registration is provided by the RIHA administrator. After obtaining access, the information system administrator fills in the necessary data fields.

In addition to the metadata of the information system, the administrator submits necessary data on the services provided by that information system (in case of X-Road, the administrator does not need to register the services separately) as well as on the classifications and standards used. Should the administrator need data from another information system, he can submit a respective proposal via RIHA to the administrator of that information system to create a new service. The same option is planned to be developed also for citizens (based on authentication with the ID card).

It is possible to search for all objects in RIHA; information systems and agencies that have joined X-Road have been structured by administrative fields (ministries). The basic data in RIHA are public and accessible for everyone.

1.5 BASIC PRINCIPLES OF THE ESTONIAN INFORMATION SECURITY POLICY

IT security has become a very topical issue. Allegedly, unpatched computers connected to the internet can get infected in less than 20 minutes even without being directly attacked. At the end of 2004, 518 000 compromised computers were used for attacks through the web, while renting such a "zombie" computer costs less than ten U.S. cents per week. New risks to PCs arise almost every week and the internet is predicted to become unusable. Could ensuring IT security be left in the hands of people and business or should the state take action here?

The need to actively address IT security issues has been recognized at national as well as international level. The Principles of the Estonian Information Policy 2004-2006 also calls for elaborating the basic principles of common IT security policy. In 2005, a joint working group of public and private sector representatives drafted a document on the basic principles of Estonian information security policy. As the document is still in the pipeline and, thus, subject to change, the present article gives an overview of the end-2005 version.

The main goal of the Estonian information security policy is to contribute to the development of a secure and security-aware information society. The specific objectives of the policy are the following:

- elimination of non-acceptable risks to electronic communication networks and information and communication systems (note that according to the standard EVS-ISO/IEC TR 13335-1:1999, risk is the potential that a given threat will exploit vulnerabilities to cause loss or damage to an asset or group of assets, and hence directly or indirectly to the organization. Eliminating of non-acceptable risks lies in bringing such potential to an acceptable level);
- protection of basic human rights;
- increasing the competitiveness of the Estonian economy;
- effective public and private sector co-operation in the field of information security in Estonia as well as at international level;
- raising awareness about IT security and providing the respective training.

Proceeding from these goals, the information security policy is designed to address the main IT security issues both in the public and the private sector in Estonia. The information security policy contributes to critical information infrastructure protection and takes into account information security aspects in other fields of critical infrastructure protection. The various fields of information security policy (e.g. co-operation and co-ordination, critical infrastructure protection and response to cyber crime) provide support and basic data for the protection of critical infrastructure and vice versa. The information security policy will not be applied to the processing of data or systems related to state secrets or military use.

The policy comprises five domains:

Co-operation and co-ordination – co-ordination of the elaboration and promotion of information security policy. This domain includes the co-ordination of information security related tasks and respective communication at national and international level; co-ordination of the Estonian ICT environment risk analysis; development of computer security incident response capacity in Estonia; establishment of a contact point for the co-ordination of national and international co-operation in the field of information security etc.

Crisis management and cyber crime – protection of critical information infrastructure; inclusion of information security aspects in other fields of critical infrastructure protection; co-ordination of activities related to combating cyber crime; and co-ordination of international cyber crime related initiatives.

Awareness raising and training – activities related to awareness raising and training in the field of information security, provision of IT security training for top-level management and IT managers of state agencies, and awareness raising for the general public.

Drafting and updating IT-security related legislation – specification, elaboration, implementation and renewal of procedures, documentation and means for ensuring information security of ICT infrastructure and electronic communications. Among other things, the following legislation should be addressed: drafting and updating of legislation on information security and electronic communications; regulations for the protection of critical information infrastructure; organisation of the maintenance of databases pursuant to the requirements of the system of security measures; elaboration and implementation of risk analysis indicators; elaboration of information security standards to be applied in public procurement, etc.

Activities for the protection of people and assets – protection of human rights and implementation of protective measures in businesses. This domain includes the implementation of measures related to the protection of personal data, development and application of secure (ID-card based) standard solutions, launch of cross-border pilot services based on the ID-card, etc.

The development of information security calls for public and private sector co-operation at national as well as international level. The elaboration and implementation of information security policy is co-ordinated by the Ministry of Economic Affairs and Communications. To this end, the Ministry intends to establish an information security working group that will lead the drafting and updating of information security policy and strategy, ensure the involvement of the private sector in the process, co-ordinate the establishment of sectoral working groups, etc.

In order to implement the information security policy in a co-ordinated manner, the Ministry of Economic Affairs and Communications ensures the inclusion of actions in various fields of the Estonian information security policy in the annual information policy action plans.

1.6 CERT ESTONIA

In order to protect an organisation's assets and ensure their security, timely detection of security incidents, their proper handling, as well as appropriate follow-up activities are of vital importance. The management of these activities might have a considerable impact and, thus, they should be of critical importance for all organisations.

Up to 2005, there were no organisations in Estonia with direct responsibility for handling security incidents, ensuring respective co-ordination between different organisations, and providing assistance in responding to security threats. Also missing was a national contact point for international co-operation in the field of IT security.

The Computer Emergency Response Team of Estonia (CERT Estonia), established in 2005, is an organisation responsible for the management of security incidents in .ee computer networks. Its task is to assist Estonian internet users in the implementation of preventive measures in order to reduce possible damage from security incidents and to help them in responding to security threats. CERT Estonia deals with security incidents that occur in Estonian networks, are started there, or have been notified of by citizens or institutions either in Estonia or abroad.

The support provided by CERT Estonia depends on the type and severity of a security incident, on the number of users potentially affected by it and on resources available for the organisation.

Security incidents are prioritised according to their potential severity and scope. The following aspects are taken into account in the prioritisation of security incidents:

- the number of affected users;
- the type of an incident;
- the target of an attack as well as the attack's point of origin;
- required resources for handling the incident.

High-priority incidents include, for instance: attacks that may jeopardise people's lives, attacks at internet infrastructure (name servers, major network nodes and large-scale automatic attacks at web servers), etc.

As CERT Estonia does not render services to end users, the latter should, in case of security incidents, turn to system administrators either at their internet service provider or in their organisation, to network administrators or customer support.

CERT Estonia offers the following services:

- Incident handling – receiving incident reports, assigning priorities to incidents according to their severity level, performing incident analysis, responding to incidents, giving assistance in incident response, co-ordinating incident response activities.

- Giving information and issuing warnings – informing users about attacks, viruses, worms, Trojans occurring in .ee networks and notifying about vulnerabilities discovered in the most widely used systems and applications in Estonia. Warnings are mainly issued in cases of attacks with higher level of severity, extremely widespread viruses, and highly severe vulnerabilities.

Once CERT Estonia has managed to successfully launch the above-mentioned services, the organisation also intends to contribute to the promotion of awareness-raising in the field of IT security. For more information, see http://www.cert.ee .

1.7 E-VOTING IN ESTONIA

Though small-scale pilots on internet-based voting have been carried out in several countries, the number of those having been able to confirm the internet-based votes valid is still small. In Estonia, internet-based voting was used during the local government elections in October 2005. For the first time, the new kind of voting was applied countrywide.

The development of the Estonian eVoting system was started in 2003 with an objective to provide voters with an additional opportunity to cast their votes, raising thereby voting activity and voting convenience. eVoting does not replace the traditional methods of voting: each voter can decide himself, whether he votes electronically or in a traditional way.
Legislative framework for of eVoting was put in place in 2002 and, thereafter, the National Electoral Committee decided to launch a project targeted at the development of eVoting system. The objective of the project was to enable eVoting during the local government elections of 2005.

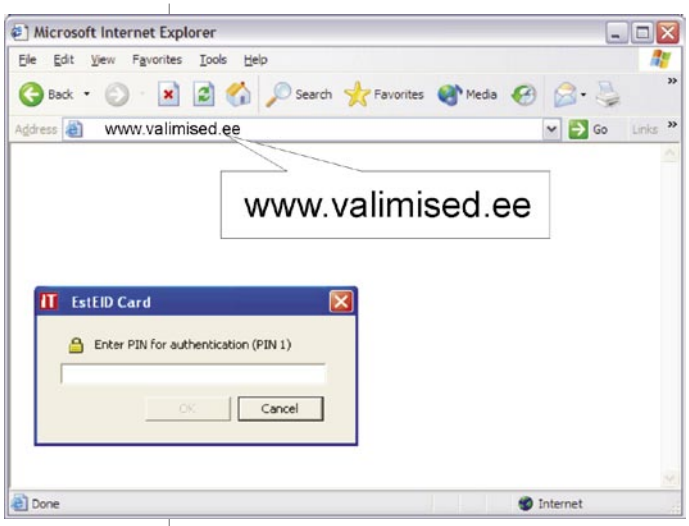
By the end of 2001, ID card enabling secure personal authentication and digital signing as well as the public key infrastructure (PKI) necessary for that had been developed in Estonia. ID cards had been issued since January 2002, and by October 2005, the respective figure was about 850.000. Thus, most of eligible voters (1.06 million) had the national ID card.

eVoting took place during advance polls and ID cards were used for voter authentication. Only authenticated people with the right to vote were able to cast their vote, meaning that a database of citizens with the right to vote was developed prior to elections.

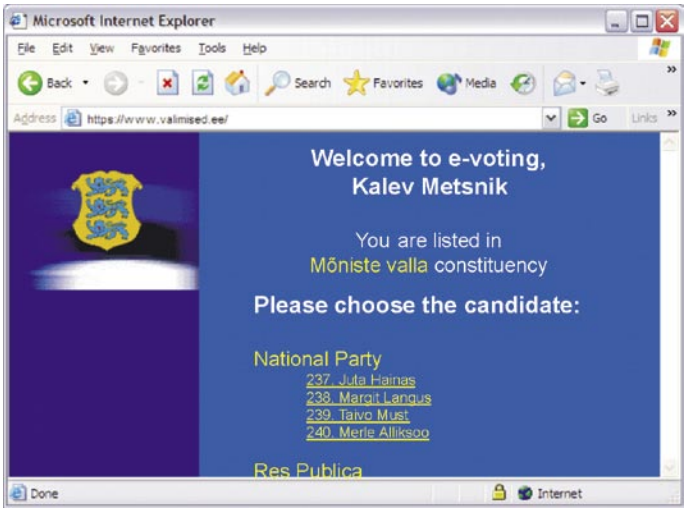
eVoting followed all principles characteristic of traditional voting. In order to avoid the influencing of voters there was a possibility of electronic re-vote – e-voter could cast his/her vote again electronically. Only the last vote was counted. Additionally priority was given to traditional means of voting (with paper ballot) - if the voter went to polling station during advance polls and cast a vote, his or her e-vote was deleted.

In short, the voting procedure was the following:

- the voter inserted the ID card into the card reader and opened the website for voting (http://www.valimised.ee/);

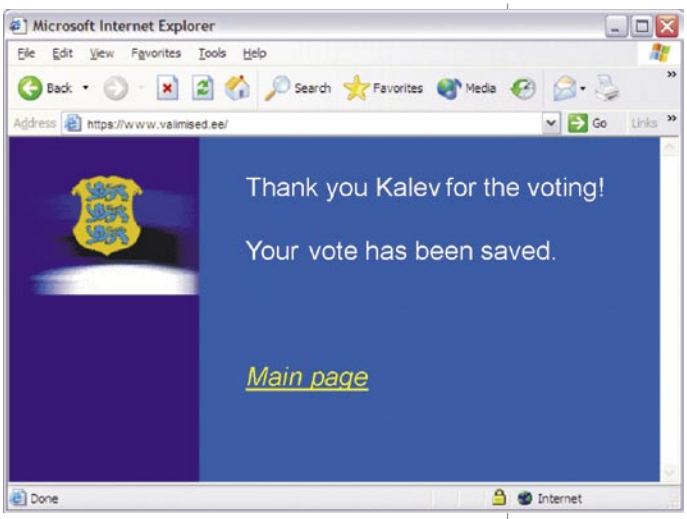


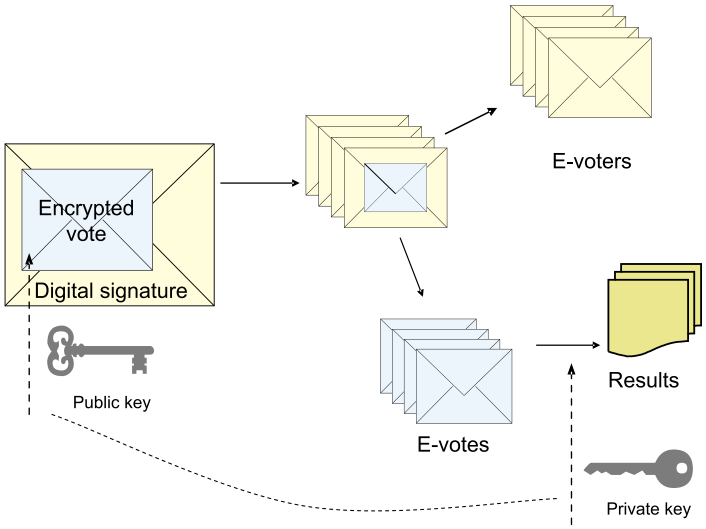
- the voter identified himself using the PIN1 of the ID card;



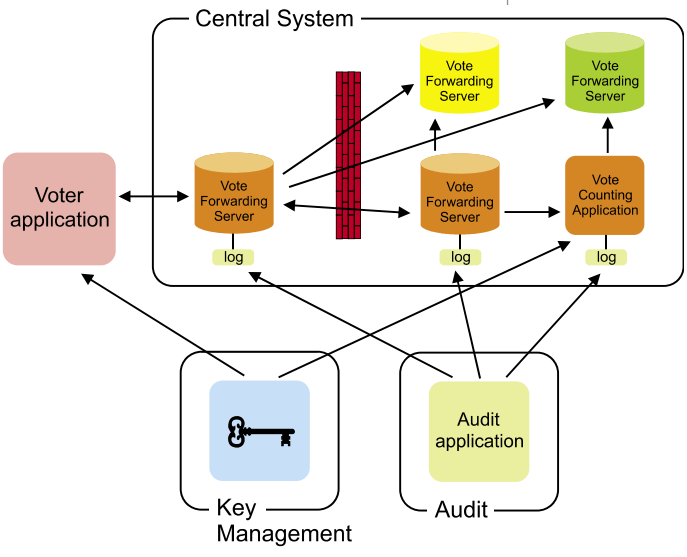
- the server checked if the voter was eligible to vote (by using data from the population register)
- the voter was shown a list of candidates in the electoral district of his residence;

- the voter made his voting decision, which was encrypted;
- the voter confirmed his choice with a digital signature (by entering the PIN2-code);





- when counting votes, the voter's digital signature was removed. After this, members of the National Electoral Committee collegially opened anonymous e-votes and counted them.



- After the electronic voting and advance polls ended (on the 4th day before the election day), a list of e-voters was comprised and sent to polling stations in order to prevent voters from voting more than once.

9317 voters voted electronically, 30 of them decided to go to a polling station too and, thus, their e-votes were deleted. The number of valid e-votes was 9287 accounting for 1.85% of all votes cast.

More information about the principles of the Estonia's eVoting system as well as its technological solutions can be found at the web site of the National Electoral Committee: http://www.vvk.ee/engindex.html.

2. USE OF EU STRUCTURAL FUNDS FOR THE DEVELOPMENT OF INFORMATION SOCIETY IN ESTONIA

As a member of the EU, Estonia has the possibility to participate in the formulation of the community's regional policy and receive financial assistance from the EU budget. As a basis for the strategic implementation of the EU financial support, Estonia has elaborated a document called "Estonian National Development Plan for the Implementation of EU Structural Funds – Single Programming Document 2004-2006" (SPD), which has been approved by the European Commission. SPD serves as a basis for the joint activities of Estonia and the EU in promoting Estonia's social and economic development. The fourth priority of the SPD – Infrastructure and Local Development – envisages support also for the development of the information society. The first level intermediate body for the measure is the Ministry of Economic Affairs and Communications, while the tasks of the second level intermediate body have been assigned to the Estonian Informatics Centre.

The measure for the development of the information society (Measure 4.5 – "Information Society Development") is aimed at achieving the objectives set out in the "Principles of the Estonian Information Policy 2004-2006" and the eEurope 2005 action plan.

While in 2004, the main focus was on the preparation and evaluation of projects, on January 27, 2005 the Government of the Republic approved the main and additional lists of projects for the financing under the measure. The proposers of the 19 projects of the main list prepared, during spring 2005, their public procurement materials and all their applications were approved.

Projects that received funding within the information society measure in 2005 were the following:

- development and implementation of the Admissions Information System (SAIS);
- reorganisation of national geoinformation systems for OpenGIS architecture;
- development of data services of the Land Information System;
- development of the Electronic Health Record project;
- reorganisation of the general information system of the police and development of e-services for citizens and state agencies;
- development of e-services of the Estonian Agricultural Registers and Information Board;
- development of the Family Register;
- development of the Electronic Registration project;
- development of the presentation layer for the state information system;
- development of the Electronic Prescription project;
- development of a service for the registration for national examinations and for the communication of the results of exams;
- development of the software of the Population Register;

- development of the paperless ARK (Estonian Motor Vehicle Registration Centre) project;
- development of the system of address details of the State Register of Construction Works;
- enabling real-time publication of geodetic data concerning buildings in the State Register of Construction Works;
- development of a portal for local government councils;
- development of the Electronic Images project ;
- development of public e-services in the field of standardisation;
- development of e-services of the Population Register.

Since the total of main list projects does not cover the whole assistance granted and considering that in case of projects to be completed first, certain share of assistance is likely to remain unused, the implementation of the first project of the additional list of investments has been launched.

While final recipients deal with the implementation of specific projects and the Estonian Informatics Centre is responsible for their guidance and evaluation, the elaboration of a new development plan for the implementation of Structural Funds in 2007-2013 has begun at the initiative of the Ministry of Finance. One of the major changes to be introduced in the field of IT, is the renouncement of elaborating project lists of investment plans. In other words, during the new programming period, only concrete projects (not ideas to be implemented in six years' time) will be eligible for the EU structural assistance.

Below given is an overview of some of the projects that received funding from the EU Structural Funds.

2.1 USE OF STRUCTURAL FUNDS FOR THE DEVELOPMENT OF THE POPULATION REGISTER AND THE FAMILY REGISTER

Current situation

The existence of a state is based on its population. Information about the size of its population and demographics is created through registration of all population events related to people. Population events include birth, death, migration, marriage, divorce, as well as the related acts, such as filiation, changing one's name, adoption etc.

So far, electronic registration of population events in Estonia has been somewhat unsystematic. As data concerning family events form a part of the data composition of the Population Register, the respective developments have been carried out within its limited possibilities. Despite the fact that the lack of electronic workflow system for family events does not hinder the electronic issuing of documents, the rest of workflow and communication is still done on paper. There are no possibilities for electronic submission of applications or for automated workflow covering different stages, such as automated transmitting of applications, deciding upon them etc. The current IT solutions of the Population Register do not correspond to standards, practice and objectives established for data collection of family events. Moreover, the workflow procedure is not convenient for citizens (there are no electronic services) and the work is labour-intensive and inefficient for officials.

For the above-mentioned reasons, the quality and reliability of data cannot be ensured. This, in turn, has led to a situation, where other agencies feel the need to maintain data also in their own registers. In addition, as the Population Register was established only in 2001, it lacks data about earlier events of individuals, which is why family events cannot be proved electronically. Thus, citizens have to go from agency to agency, carrying around specific certificates, applications and attestations in order to present them to officials in other agencies.

Currently, the Population Register performs various functions, serving, on one hand, as a workflow register for proceeding family events and registering place of residence and, on the other hand, as a holder of data collected into other registers. This has led to a situation, where, due to insufficient resources, attention has mainly been placed on the performance of Population Register's core tasks, e.g. on data collection from different registers and their preservation, while modernisation of workplaces of registrars, who directly proceed the register's documents, and creation of citizen-oriented services have received considerably less attention.

Objective of the Family Register project

The project forms a part of a larger objective of the state to develop a common population system that would maintain, collect and proceed population-related data. The main objective of this particular project is to ensure, by the development of the Family Register as a workflow and document register, legitimacy of the documentation concerning population events and fast and efficient service provision for citizens. The Family Register will function in close co-operation with the Population Register, which will maintain personal data of persons,

whose data are being proceeded, and will obtain information from the Family Register about events in an individual's life as well as about documents related to those events.

The sub-objectives of the project are the following:

For citizens:

- to make the registration of family events as accessible and easy for citizens as possible, accelerating thus the whole process;
- to develop a system of procedures so that citizens would not have to prove their family events in different agencies by presenting various paper documents;
- to develop an electronic information and proceedings system for the documentation of family events that would inform citizens in a simple and understandable manner, what, who, and where has to do in order to register family events.

For officials:

- to modernise the workplaces of family events registrars so as to allow them to obtain information from other registers without changing computer programmes;
- to facilitate the work of officials by automating workflow procedures. Electronically submitted applications from citizens and information obtained from other registers (mainly the Population Register) will automatically generate the necessary document, after which the official makes a decision. The software in use must assist the official, guiding him or her through the process, and checking the quality of his or her work;
- to speed up officials' work by facilitating the communication of information;
- to give legal effect to data concerning family events so that it would be possible to use such data as legal basis in the decision-making processes;
- to increase the speed and quality of work of officials by improving the quality of data related to population events.

Expected outcomes of the project:

In order to provide increasingly more services to citizens via electronic channels, data must have legal effect. The fully electronic provision of the family benefit service in Estonia became possible due to the fact that data related to birth registration of children that were born after the establishment of the Population Register (2001) are all maintained in the register. The range of services to be offered electronically will expand considerably once family events of all people will be entered in it.

No services can be developed unless there is data based on which services could be elaborated. By adding data about family events to the Family Register and improving the quality of the existing data in the Population Register, various new services can be developed. These services could also be used as a basis for workflow procedures and decisions requiring legal basis.

For instance, in order to apply for the old-age pension, one has to submit, among other documents, his/her birth registration and certificate for marriage in case one has changed his/her name upon marriage. All these documents belong to the data composition of the Family Register. If such data were entered in the register and interoperability of different information systems were ensured, citizens would not to have to submit any paper documents. Besides, officials dealing with the allocation of benefits should not enter data into their system, but could use them automatically.

Since the maintenance of registers and data collection pose a considerable burden on the state budget, development of central registers and use of data maintained in them becomes increasingly important. In addition, the state would benefit from increased quality of main personal data, expediency of data collection, better use of personnel, and higher quality of other procedures. Data occurring as a result of the development of the Family Register will serve as a basis for personal data in the Population Register.

Application of high-quality information in state administration processes as well as the possibility to use up-to-date data will improve the quality and speed of decision-making in the state. High-quality data to be created via the Family Register will be used as a basis in decision-making both by local governments and the Parliament.

New services allowing to communicate with the state without physically going to state agencies will give serve as encouragement also for those people, who so far did not bother, for instance, to register their place of residence, as they considered the process inconvenient. With the introduction of the respective e-service, the quality of place of residence data is expected to be improved, there will no longer be need for other agencies to double-collect them.

In addition, citizens will no longer have to run between different state agencies, as the processes will be fully automated: beginning from submitting applications up to sending information between different agencies. Thus, citizens will only have to physically communicate with officials once, when they receive their final documents.

Officials' workplaces will be modernised, putting thus an end to the simultaneous use of two different software. Workflow procedures will be facilitated for officials and, due to the use of digital signature, they will assume direct responsibility for electronic documents. Due to reduction in the amount of paper-based documents, officials' working processes will be faster.

As the time for performing new vital statistics registration procedures will be shortened, officials will have time for entering earlier vital statistics registration in the register. Thus, no extra staff will have to be hired for the entering of such data.

For the entering of vital registration statistics of archival value one has to currently go the paper archive, where a dossier containing the required act has to be sought out, carried up from the basement, entered in a database, and then taken back again. Due to the possibility to use electronic images of documents, much of the time that used to be spent on bringing the dossiers up and down is now saved. Moreover, this has brought along additional rationality, as the right image is found from the electronic archive and entered in the system right away, saving thus time that was earlier spent on the mechanical processing of documents that would never be used.

Due to the improved quality of data, data users will be able to use data about their marital status and place of residence as legal basis. As a result, the need to check paper documents will lead to improved quality of work as well as to faster workflow management. The range of areas, where data collected about individuals could be used will extend, as instead of data collection agencies will be able to dedicate more time to the performance of their core activities.

2.2 REORGANISATION OF GEOINFORMATION SYSTEMS

For the reorganisation of public sector geoinformation systems (GIS), the Public Sector Infrastructure for Spatial Information based on OpenGIS standards is under elaboration. This comprises the network of related spatial data servers and provides the technological (software) base for integrating various spatial data into a whole. This way, the public sector geoinformation resources will be created, which will utilise interoperable datasets' network and ensuing synergy. It will facilitate co-operation between state agencies and enable to enhance the quality of citizen-oriented public sector services. For citizens, it will take very little effort and time to get answers to their queries or communicate with state agencies. Civil servants processing spatial data also spend considerable amount of time on preparing, gathering, approving, controlling and entering information and drafting responses. Automated data processing tools would simplify the work of civil servants, e.g. perform complex queries to different databases; compare data and check upon their quality; ensure compliance with data security requirements (confidentiality, integrity, availability, time-criticality); draft data exchange documents, etc. This way a lot of workforce could be saved and the quality of public and online services provided by the public sector agencies would increase.

Various procedures (e.g. public disclosure and adoption of plans, registering of cadastral units, issuing building permits, identifying environmental pollution, formation of new address units, etc.) produce a lot of (spatial) data about the same geographical location. The availability of such location-based information allows for better understanding and assessment of the region's value and thus enables to make respective public processes more transparent, i.e. civil servants can better administer and citizens and entrepreneurs can better monitor these processes and this way also participate in the administration process. One and the same region might often be involved in various plans. The question is how these different plans take account of each other and whether the outcomes are mutually consistent? Therefore, it is important that data (incl. the status of other registers) necessary for decision-making is always available and after the registration new data is accessible for other user groups. Consequently, when the amount of spatial data grows, the use and administration of such data becomes more complicated. Spatial data processing (incl. analysis, control, and updating) entails the simultaneous and immediate use of data from different data sources (different institutions and various servers). That is why spatial data have to be interoperable, semantically comprehensible and highly available. A large amount of data resulting from procedures or observations is entered in registers on a daily basis. This includes location data on the event or object(s). Generally, the normal user cannot control such data acquisition, i.e. the user is not aware of whether and what kind of information has been gathered. Therefore, it is ever more complicated to obtain an overview of the availability, quality, status, sources and conditions of use of (spatial) data. The solution is to make metadata (data about data) accessible for users. All in all, the implementation of rules for co-operation between spatial data administrators and the use of automation equipment ensuring the interoperability of databases is inevitable. The reorganisation of public sector geoinformation systems and the development of the Land Board's data services provide a solution for the above-mentioned problems. Other registers and state information systems should take advantage of the new spatial data infrastructure as well by taking into use available services and also by providing their own services.

EU structural funds enable to employ extensive IT developments to harmonise and standardise public sector geoinformation systems. The application of open GIS standards creates essential prerequisites for the interoperability of GIS and efficient co-operation between the producers

and consumers of spatial data, even all the way through the value adding chain. Moreover, Estonia's ability to co-operate in international projects, e.g. within the framework of INSPIRE, would increase.

The joint use and reuse of open GIS standards and jointly established spatial information would considerably save resources. The state would hold all rights related to the employment and further development of software solutions for the Public Sector Infrastructure for Spatial Information. The server software created in the course of developments could be used throughout the public sector – in state agencies, local governments as well as by private individuals performing public duties. In addition to the software and preset services located at the provider of the central data services (the Land Board), spatial satellite data servers of the Public Sector Infrastructure for Spatial Information will be introduced in four state agencies as a pilot project.

Use of Public Sector Infrastructure for Spatial Information

The technical infrastructure for spatial information comprises the system of spatial data servers. Servers exchange data via the X-Road infrastructure and also directly over the internet. Spatial data servers communicate with each other and ensure the integrity of data and their synchronicity with data sources. The users of the Public Sector Infrastructure for Spatial Information are state agencies and local governments as well as private individuals and citizens communicating with servers via geoinformation portals.

In case of mission-critical solutions of agencies it is possible to use the so-called spatial satellite data server that reflects spatial data from other servers. The state agency can perform fast and secure queries via the spatial satellite data server on data of other agencies. The state agency can also store its own spatial data in the spatial satellite data server and use them for its own good or allow them to be used by other agencies through open GIS services. This way, all state agencies can integrate into the general Public Sector Infrastructure for Spatial Information. Thus, the spatial satellite data server functions as an "intermediate memory" and an adapter and performs two basic functions: a) gathering information from the data sources of other agencies (replication), and b) making spatial data produced by the agency itself available for other agencies.

The **architecture** of the Public Sector Infrastructure for Spatial Information consists of five layers: the data sources layer, the data services layer, the communication layer, the application layer, and the client layer. The realisations of these layers might be and often are located in the various nodes of the network solution. These nodes are in different geographical locations and they form an integrally functioning solution, as they are interoperable.

GIS architecture layer	Description
Data sources layer	Data sources include various databases, bitmap and vector graphic spatial data, and OGC standards (WMS, WFS, WCS) based data services intermediating raw data and maps. The services of that layer can be used in a cascade.
Data services layer	The data services layer includes application servers' software components, which intermediate data from data sources. The services of that layer can be aggregated through complex queries.

Communication layer	The communication layer includes the business logic of the created architecture, incl. authorisation data and catalogue services describing the sets of objects, sets of maps, data sources, qualities of services and conditions for their use. The communication layer provides direct services WMS, WFS, WRS, and SOAP (data exchange protocol of X-Road) to the client layer.
Application layer	The application layer is for preparing data according to the specifics of the client application (e.g. SVG, HTML, FLASH).
Client layer	The client layer is usually a web browser, e.g. Internet Explorer, Netscape Navigator, Mozilla Firefox, Opera. The web browser supports SVG, JavaScript and/or Flash.

Development of the Public Sector Infrastructure for Spatial Information

The Land Board plans to develop the technical infrastructure for spatial information in 2006. This includes the following objectives:

1. to create interoperability between all public sector geoinformation systems based on open standards (e.g. the GIS server used in the Police Board would obtain its base maps either from the Land Board or some other agency providing a service compatible with OpenGIS standard and would display these data layers together with its own data layers so as to provide the police officer with the best possible base map together with necessary additional data);

2. to provide all state agencies and citizens with the possibility to use digital maps developed by the public sector and based on OpenGIS standards;

3. to ensure preconditions for the usability of digital maps together with regional or administrative data layers (e.g. rural schools, tourist attractions, fire hydrants, etc.);

4. without any significant additional costs, to exploit new data sources, provide new data services through open interfaces, and connect existing applications with spatial data;

5. to ensure authorised use of data (e.g. objects falling into Category I of nature protection level are only accessible for authorised users);

6. to ensure a simple search mechanism for finding information about the availability of spatial data and maps, their accessibility, possibilities of use, as well as about the conditions for their acquisition and use, i.e. to develop a catalogue service about the availability of spatial data as well as about different map applications' functionality and conditions of use;

7. to launch the pilot application of the spatial satellite data servers of the Public Sector Infrastructure for Spatial Information in the Ministry of Economic Affairs and Communications, the Estonian Informatics Centre, the Ministry of Internal Affairs, and the Ministry of the Environment.

Development of Estonian Land Board's data services

In compliance with the reorganisation of the public sector geoinformation systems and the related technical infrastructure for spatial information, the Estonian Land Board plans to develop various new data services for end users (citizens, entrepreneurs) as well as for the national "back-office" (at tzn, synchronisation, generalisation, aggregation, and logging of spatial data (maps, bitmap data, vector data) will be elaborated. Data services will be provided with multilingual support.

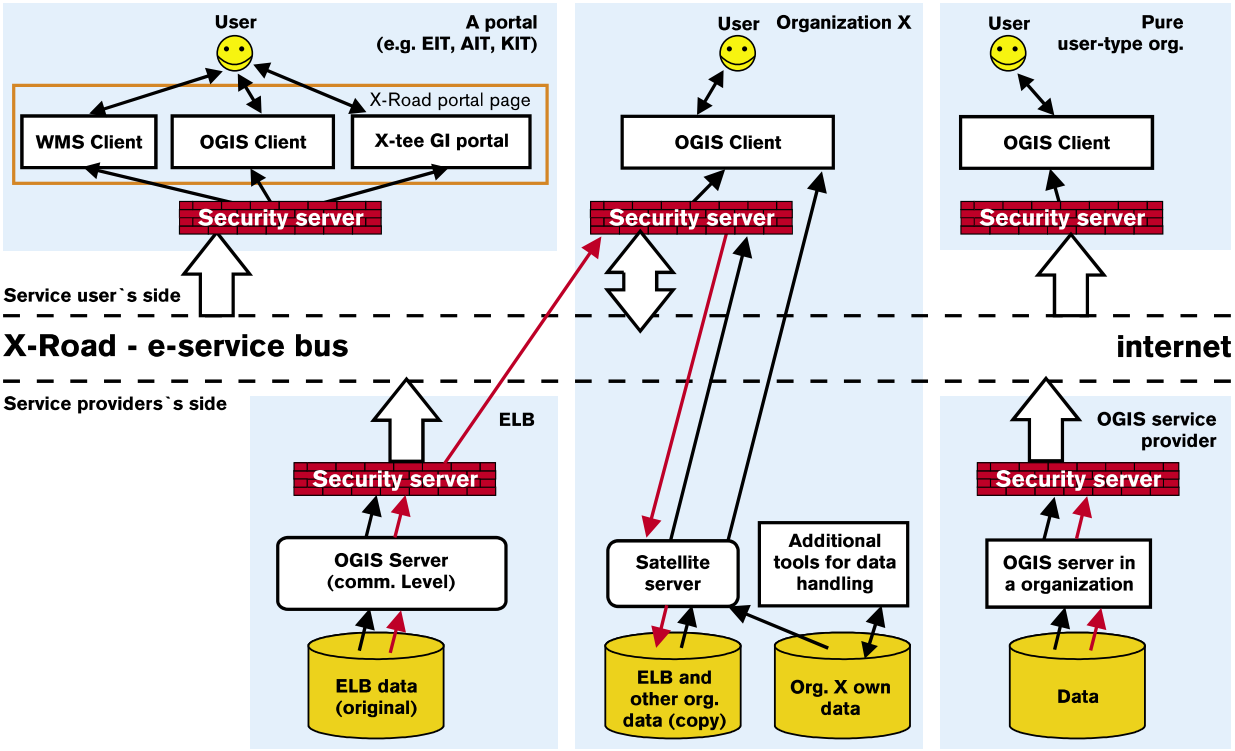


Figure 3. Architecture – user view.

2.3 ESTONIAN POLICE BOARD

The objectives of the Police Board's project „Re-organisation of the general information system of the Estonian police and development of e-services" are the following:

- to develop new services for citizens and organisations in order to facilitate the communication with the Estonian police (submitting applications, making enquiries, etc.);
- to increase the efficiency of police officers' work;
- to ensure better integration of the general information system with other information systems of the police;
- to improve the quality of data in police information systems.

The project is divided into six themes:

- development of e-services for individuals and organisations;
- development of the operational management information system;
- development of the information system for offence proceedings;
- development of the map server;
- development of the punishment register;
- development of a new architecture for the POLIS information system.

Below given is a short overview of these themes.

Development of e-services for individuals and organisations

The aim of this sub-theme is to make information accessible for citizens through X-Road enquiries in the citizen portal. This would bring the police closer to citizens and allow savings both in terms of citizens' time and administrative costs of the police.

The e-services to be developed within the project are divided into three categories:

1. **Public services,** e.g.:

- issuing guidance on how to act in certain situations (e.g. in case of theft); advising how to protect oneself as well as one's property; explaining, in an understandable manner, police work processes (to make citizens understand, why certain procedures take more time than others etc.);
- displaying, on the map of Estonia, constable districts and developing the possibility to obtain information directly from the map about a particular area (which constables work there, what are their office hours and contact data etc.);

- displaying crime statistics on the map;
- giving anonymous information to the police.

2. Services requiring authentication, e.g.:

- submitting applications to the police:
- applications about criminal acts;
- specific applications (e.g. applying for a weapons permit etc.);
- accessing data concerning one's own offence proceedings (to an extent which does not hinder conducting the proceeding);
- accessing data concerning one's own punishments;
- making request for information.

3. Services for other organisations

A significant amount of data maintained in the police information system is of interest for other organisations, e.g. information concerning fugitives, stolen vehicles, traffic accidents, data and documents concerning proceeding decisions, suspension of the right to drive etc.

In addition, the police itself needs data from other information systems, such as the Traffic Register, the information system of the Citizenship and Migration Board, the Estonian Traffic Insurance Foundation. In the future, the police should increase the number of its data sources by the Punishment Register, the Population Register, the Commercial Register, the Register of Driving Licenses, etc.

Development of operational management information system

With the launch of the ePolice project in 2004, a clear need arose for control centre software, which would allow displaying the location of patrol cars based on information provided by their control devices (GPS – GSM). Within the pilot of the project, a solution was developed for displaying the location and status of patrol cars on the map as well as for accessing data about patrols in the police general information system POLIS. Other functionalities to be added into the system include those for receiving messages from the control centre and for managing patrols.

Development of the information system for offence proceedings

Within this project, a system with role-based user interfaces will be developed for conducting and managing both misdemeanour and criminal offence proceedings. The system must be interoperable with the Register of Criminal Matters and the electronic workflow information system eRecord of the Ministry of Justice (for more information about IT solutions in the field of legal protection, see Chapter 7.3).

Development of the map server

Within the project, vector layers of the Land Board's basic map will be combined with map data

developed by the Estonian company AS Regio, ensuring thus a common design to the whole map (woods and parks will be similarly green etc). In addition, orthophotos will be entered into the server, allowing to use them both instead of the basic map and in combination with it. The administration interface will enable to turn the different layers of the map on and off according to the particular needs of an application or a service.

Development of the punishment register

The objective of the project is to ensure, via X-Road services, the entry of data into the Punishment Register from the following information systems:

- the Population Register;
- the Commercial Register;
- the information system of court decisions;
- the information system of bailiffs;
- the probation supervision information system.

Development of a new architecture for the information system - POLIS

The architecture of the existing information system dates from 1995 and has become technically outdated. The new architecture must be:

- more open,
- more modular,
- more standardised,
- easier to use,
- more efficient,
- easier to administer,
- and it must contain different role-based user interfaces.

Main activities of the police are divided into three sub-systems:

1. incident management – workplace for the control centre's duty officer;
2. case management – workplace for a person conducting offence proceedings;
3. statistics and reporting – an analyst's workplace.

This division will be taken into account also in the development of user interfaces in respective sub-systems. The new sub-systems will be created in a development environment with the new IT architecture. E-services will first be developed for the existing system. In the final stage of the project, the current system together with its interfaces will be migrated into the new architecture.

2.4 ESTONIAN MOTOR VEHICLE REGISTRATION CENTRE (ARK)

The Estonian Motor Vehicle Registration Centre has launched several projects that aim to make the agency more customer-oriented and convenient both in the virtual and the physical world. Increasing the efficiency of ARK's internal processes is also of great significance in order to reduce irrelevant bureaucracy and leave more time for the performance of the organisation's core activities.

Information system for the verification of state fee payments - TASU

The objective of TASU, to be completed by the end of 2005, is to ensure better handling of information about state fee payments.

So far, clients have presented their payment orders on paper in ARK bureaus, after which the orders have been entered in a database. Such a system is time-consuming both for the front-line staff entering tax-related information in databases and for customers themselves, who must ensure that they have paper-based payment orders on them.

TASU will consolidate information on payment receipts from different banks. So, when a customer goes to ARK in order to perform an operation, information will already be available on whether or not the customer's payment has been received by the agency.

In addition, customers will have the possibility to send pre-filled forms to ARK through TASU, reducing thus the time they have to spend on the spot. Through TASU, front-line staff will be able to quickly access pre-filled forms, transfer data automatically to the Traffic Register's database, and issue to customers the documents they require.

TASU will also create pre-conditions for the performance of increasingly more operations without the need to physically go to ARK bureaus. The system will ensure that in the future, documents and information could be issued by banks or post offices, and ARK would become, in principle, an eBusiness, just like Amazon.com.
In many state agencies information serves as the input, check-up as the process and paper (document) as the output. However, the whole procedure can be made more efficient for customers, if check-up could be carried out on the basis of information submitted through the internet and the output would be issued at a place most suitable for the customer. Why not try to standardize processes so that the identification of persons and performance of operations could be done by bank or post office workers?

Paperless ARK

The objective of the „Paperless ARK" project is to digitalise a number of time-consuming and paper-based processes between ARK and its co-operation partners. For instance, the agency intends to allow scrap yards to digitally notify ARK about the classification of a vehicle as dismantled. Besides, the agency plans to make it easier for driving schools to send their student lists to ARK.

Developments aimed at increasing customer-friendliness constitute another important part of the project. For instance, the agency intends to explore faster and more convenient ways

of notifying ARK about the loss of one's driving licence, applying for a duplicate or informing about a change in one's vehicle data.

In the implementation of innovative solutions in the public sector, regulatory environment plays an important role. Since several regulations have become outdated, amendments to laws and regulations have to be continuously made. For instance, from the technical point of view, there is no need for people to carry their driving licences and other car documents on them all the time. The Police, Border Guard and other organisations have been provided with technological equipment for checking a person's right to drive and to use a car directly from databases, making thus the requirement to have one's documents on him all the time unnecessary. According to the existing regulations, however, this requirement is still valid. Besides, there are still people, whose trust in information systems does not allow declaring this requirement officially void. It is only in close co-operation between different state agencies that prejudices can be overcome, allowing us to make the provision of public services to citizens as convenient as possible.

2.5 COMMON PORTAL FOR LOCAL GOVERNMENT COUNCILS

The objective of the portal for local government councils is to develop a common electronic working environment for all Estonian local governments, considering in particular the structure and requirements of small and medium-sized municipalities. The common portal will aim, on one hand, at increasing the efficiency of work in local governments and, on the other hand, to increase the participation of citizens in local decision-making processes.

The portal seeks to reduce the share of paper-based business processes in local governments, to bring local governments and citizens closer to each other, to facilitate the work of officials, and to enable partial or full tele-working. All users entering information in the system will be personalised (authenticated), not anonymous.

For citizens, the system will enable to monitor proceedings of the council, express their opinions, enquire the opinion of other municipality residents on a particular subject, and participate in votes. In addition, the portal will allow receiving information about the decisions that the representative they have voted for has made in the council.

For local government officials, the system will allow to take into use a flexible document management system, developed specifically for local governments and enabling the compilation and management of document within a system. The current document management systems in small and medium-sized local governments are, in essence, registers that consist of binary files and the related meta-data. In the portal for local government councils, all the information related to a document is given in the text format, enabling automatic processing and performing search either by document text or by a specific field. Moreover, officials will no longer have to devise the design for a document and then process it in an external text editor – all the necessary and adaptable templates will be contained in the system. Such a system of similar templates and categories will facilitate the search for analogous documents drafted by other local governments, learning thus how to compile one's own documents and saving valuable working-time and labour.

For council members, the system will allow to access, via the internet, council agendas and documents, make proposals and submit them electronically, vote with the national ID card by using the digital signature, as well as to involve citizens in decision-making processes.

3. PARTICIPATION IN EU PROGRAMMES AND OTHER INTERNATIONAL CO-OPERATION

3.1 PARTICIPATION IN E-CONTENT+ AND E-TEN PROGRAMMES

eContent+

The four-year programme eContent+ was launched in 2005 with the aim to continue the work started under the eContent programme. The latter lasted from 2000 until 2004 and mainly promoted better access to and more extensive use of public sector information, enhanced content production in a multilingual and multicultural environment, and facilitated the development of the digital content market.

As the eContent proved a success, a follow-up programme was launched for 2005-2008 with a budget of 149 million euros. It is important to note that the themes as well as funding principles have been modified in the new programme. While eContent laid the main emphasis on public sector information and respective value-added services as well as localisation of services, eContent+ concentrates on much more specific fields. The focus has shifted due to developments in the digital content market where localisation, for instance, has become a horizontal element in all services, and services based on public sector information are increasingly accessible via electronic channels.

The main emphasis of the eContent+ programme is on the integration of spatial data and geoinformation through various e-services, eLearning as well as the availability of cultural-scientific information. In 2005, one call for proposals was organised within the programme. By the time the present yearbook is published, the results of Estonia's participation are not known yet but, similarly to the eContent programme, eContent+ also seems to attract considerable interest.

The co-ordinator of the eContent+ programme in Estonia is the Ministry of Economic Affairs and Communications, in particular the Department of State Information Systems. The national contact point is Archimedes Foundation that gives consultations to proposers, organises trainings and promotes the programme in Estonia.

eTEN

eTEN is a European Community programme designed to help the deployment of interoperable e-services with trans-European dimension. The programme favours regional and pan-European expansion of already functioning e-solutions so as to increase cross-border dissemination of best practices and introduction of services that have already proved to be a success. Thus, the programme concentrates on successful pilot applications that would have potential also in other countries. In 2005, the programme supported the implementation of online content solutions in six thematic areas: eGovernment, eHealth, eInclusion, eLearning, trust and security, and services for SMEs.

Nine Estonian organisations participated as partners in the call for proposals in 2005, whereas no co-ordinators came from Estonia. Five organisations were partners in successful projects, i.e. projects that were above the required threshold and proceeded to the next stage of negotiations. Therefore, we might say that although more institutions (14) took part in the eTEN call for proposals in 2004, the year 2005 produced better results for Estonia. In 2004, four out of fourteen Estonian organisations partnered in projects that exceeded the necessary threshold, while in 2005 there were five of them. In this context, the RISER

(Registry Information Service on European Residents) project deserves to be mentioned. The aim of the consortia is to develop a pan-European service enabling to request official address information across borders and over the internet. In 2004, the consortia, with an Estonian IT company AS Andmevara as one of its partners, applied for eTEN funding in order to perform market validation for the service. In 2005, the project also received eTEN funding for the initial deployment in Europe.

3.2 PARTICIPATION IN THE IDABC PROGRAMME

Since the accession to the European Union, Estonia has been participating in several EU projects and programmes, including the IDABC (Interoperable Delivery of European eGovernment Services to Public Administrations, Business and Citizens) programme. IDABC aims to develop IT solutions that enable national and European administrations as well as businesses and citizens to communicate and exchange data electronically with other EU Member States and respective institutions.

IDABC, launched in 2005, is a follow-up to the IDA (Interchange of Data between Administrations) programme that came to an end in 2004.

As IDABC carries on with the work of IDA, many projects initiated under the previous programme are continued within IDABC. Such projects include:

- Integration of national information systems with respective EU information systems: secure information exchange service (TESTA), secure data exchange system (eLink) and public key infrastructure, including authorisation, certification, and infrastructure.

- Participation in the development of EU information systems: the EU interoperability framework and architecture, electronic document management (MoReq, MIReG), eProcurement, Your Europe portal, database of national legislative information (NatLex), and Interactive Policy-Making (IPM).

Relevant units responsible for participating in the developments of the above-mentioned programmes have been established in Estonia. Moreover, several initiatives similar to those being launched within the IDABC programme are already in use in Estonia. The X-Road project (data exchange layer), which has been very successful and which corresponds to the IDABC project eLink, serves as an example here.

While in 2005 there was a slight slowdown in the activities arising from the completion of one programme and the launch of the next one, in 2006 higher activity is to be expected. So far, Estonia has succeeded quite well in information society development. Thus, we should have all the necessary means to make a significant contribution to the IDABC programme.

Further information:
Official website of IDABC – http://europa.eu.int/idabc/
Official Estonian website of IDABC – http://www.riik.ee/idabc/et/

3.3 E-GOVERNANCE ACADEMY

In the summer of 2002, the Government of the Republic of Estonia, the United Nations Development Programme (UNDP) and the Open Society Institute (OSI) signed a Memorandum of Understanding, agreeing to jointly set up a regional e-Governance centre in Estonia. As a consequence, the e-Governance Academy (eGA) was officially founded in December 2002.

The main objective of the e-Governance Academy is to train and advise leaders and stakeholders in using information and communication technology to increase government efficiency and to improve democratic processes with the aim of building open information societies. Geographically, the Academy focuses on the former Soviet republics, Southern and Eastern Europe and Asia. More recently, activities in the Caucasus and in the Middle East have been developed.

One of the core activities through which eGA pursues its goals is to train high level officials, specialists and representatives of the third sector. These trainings are meant to raise awareness concerning the possibilities of ICT, and to demonstrate the importance of having a solid national policy and strategy in the development towards an information society. The content of the trainings is based on a critical analysis of Estonian and international experiences, and offers insight in how the use of ICT can have a meaningful and beneficial impact on everyday life and can realize a boost in a country's overall development and competitiveness. Trainings provided by eGA are neither academic nor overly technical, but offer practical knowledge that facilitate making informed choices and the development of sound and realistic strategies. The e-Governance Academy is also an important instrument in promoting networking, by bringing experts and participants together.

In this context, eGA provides for five-day introductory policy courses. These courses cover e-governance development strategies, industry and education issues, training on legal regulation and global issues concerning ICT development. The training programme specifically addresses various forms of public-private partnerships amongst key stakeholders, shows how the general public can and should be involved, and emphasises the critical importance of political will to ensure continuity and consistency during the implementation of adopted polices and passed laws.

During the years 2003 – 2005, eGA has provided training for more than 400 participants coming from 26 countries such as Albania, Armenia, Azerbaijan, Bulgaria, Bosnia & Herzegovina, Croatia, Georgia, Kazakhstan, Kosovo, Kyrgyzstan, Macedonia, Moldova, Mongolia, Russia, Serbia and Montenegro, Slovenia, Tajikistan, Ukraine, Uzbekistan and Sri-Lanka.

Relying on its network of specialists, the e-Governance Academy is well placed to offer consultancy services on e-Governance Issues. These services range from event-based contributions (e.g. by sending guest speakers) to more comprehensive and projects. In 2005 for example, the Academy played a mayor role in connecting schools to the internet and integrating ICT in everyday teaching in Georgia (the "Deer Leap Georgia" project), in advising on the National ICT Strategy and developing a model for modernising local government in Macedonia, and in developing a strategy concerning Electronic Document Management in Armenia.

Next to these training and consulting activities, 2005 marked the completion of the online self-evaluation tool BEGIX (Balanced eGovernance Index) that has been developed in cooperation with the Bertelsmann Foundation and the Council of Europe. The Academy has also

been active in promoting the use of free and open software, particularly in the public sector. In addition, the Academy is developing methodologies and guidelines for the reduction of corruption using ICT, and will develop this activity further.

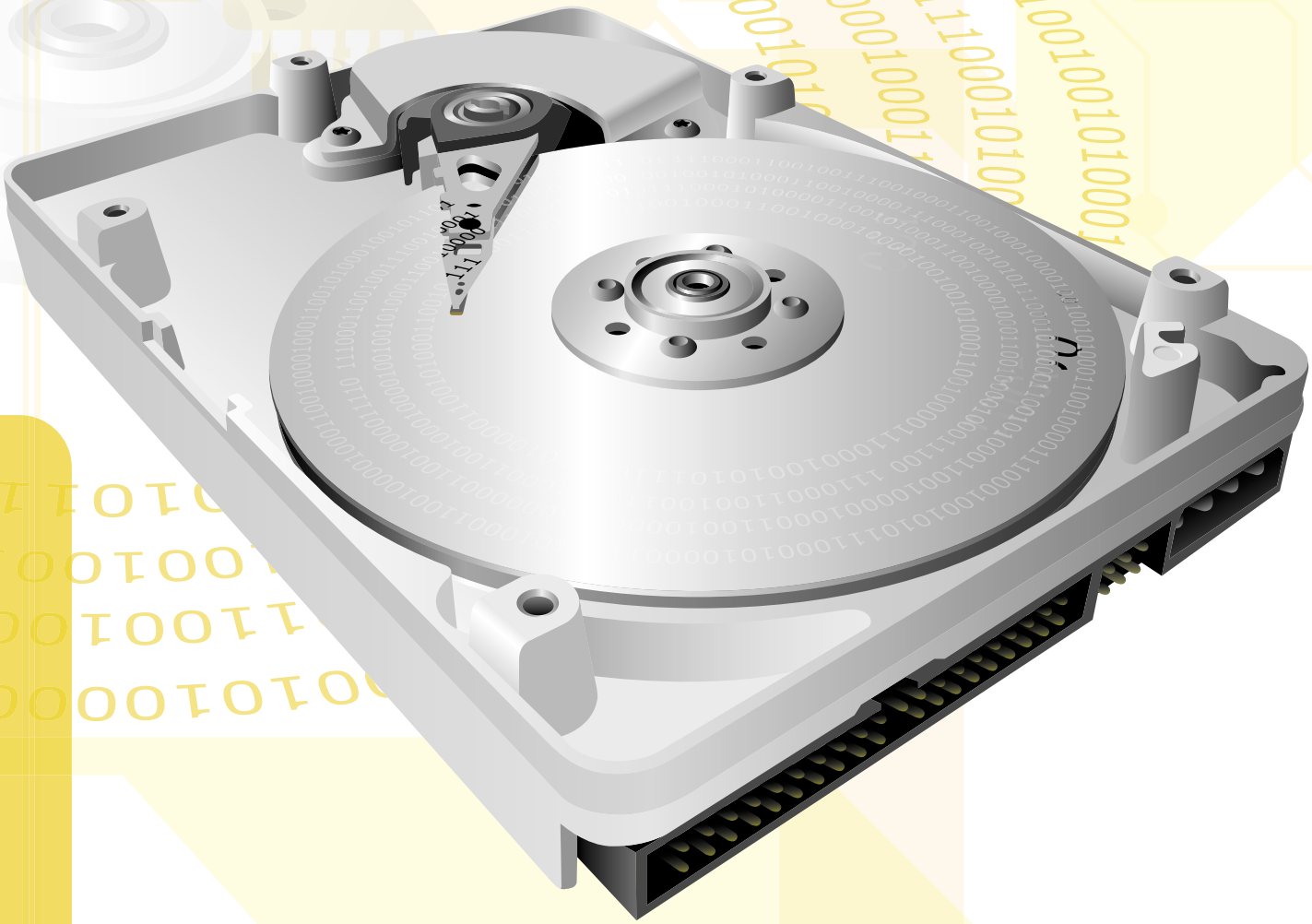
Other important issues for the coming years include the development of e-governance issues that are specifically aimed at local governments, the further extension of its activities concerning e-Democracy, and the development of materials focussing on data security and privacy protection.

As the importance of research in the Academy's activities grows, eGA will endeavour to extend its research efforts by continuing to document and systemise best practices from around the world, by initiating publications and by creating scholarship funds.

All information about the activities of the e-Governance Academy can be found on its website, www.ega.ee.

Bringing ICT into Georgian schools

4. ESTONIAN INFORMATION SOCIETY STATISTICS



In 2005, three information society surveys commissioned by the Ministry of Economic Affairs and Communications were conducted to analyse computer and internet usage in Estonian households (TNS Emor eTrack surveys of spring-autumn 2005) and the use of IT in the Estonian business sector ("Information Technology and Internet in Estonian Companies"). In addition, the ministry commissioned a survey to explore the awareness of Estonians about e-services provided to them by public administration and to analyse their usage and user-friendliness.

The following gives a short overview of the survey results.

Computer and internet usage

At the end of 2005, 56% of Estonian residents, aged 15-74, used computer regularly and 53% used the internet on a regular basis.

According to the eTrack survey (autumn 2005), almost every second Estonian aged 15-74 has the possibility to use a PC at home, indicating a significant increase in comparison with 2004 (from 32% in 2004 to 40% in 2005). Another positive sign is that most of the new home PCs are connected to the internet – 81% of households with a PC have an internet connection. 73% use broadband internet, whereas ADSL (47%) is the most widespread type of internet connection, followed by a cable modem connection (26%) and dial-up (4%).

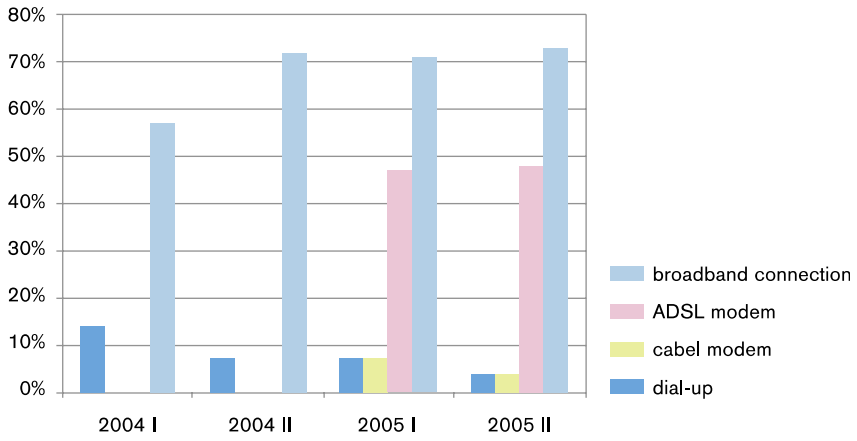


Figure 4. Types of home Internet connections (% of those having a home PC).

The number of companies connected to the internet is also on the rise. In April 2005, 75% of Estonian companies had an internet connection. Mostly broadband internet is used, whereas ADSL connection is the most popular. Merely 41% of the companies connected to the internet maintain a homepage, indicating that there is still room for development in this respect. The survey on the use of IT in Estonian companies also examined the use of public e-services and satisfaction with these. The fact that 93% of companies expressed satisfaction with public e-services shows that the implementation of ICT has facilitated business-to-government communication significantly.

The areas of internet usage are expanding. Besides exchanging e-mails, searching for information and using internet banking, which are the most popular fields of internet use among Estonians, the use of the internet for entertainment doubled in 2005, year-on-year.

While in the first half of 2004, 15% of respondents used the internet for playing games, in 2005 the respective share was 34%. Although the share of eCommerce is still quite modest in Estonia (8% of internet users), it has doubled from 2004. Using the internet for phone calls is still relatively new (8% used the service in 2005 and 4% in 2004), but the number of users has doubled over the year, showing the growing popularity of the service.

Figure 5. Internet use by specific purposes (% of those having used the Internet in the last 6 months).

The survey on computer and internet use of Estonian households and the survey on the IT use in Estonian companies also explored Estonians' awareness about IT security issues. The results revealed that Estonians, both households and enterprises, are quite well aware of security issues. The occurrence of security problems has decreased from 53% in spring 2005 to 44% at the end of 2005. This shows that Estonian internet users acknowledge potential risks to security and take measures to protect their computers. 79% of residents that have an internet connection at home use antivirus software, while the respective indicator for enterprises was 84%.

Use of public e-services

Estonians consider public e-services easy to use: 66% of internet users surveyed in spring 2005 rated the user-friendliness of public e-services with a "5" or a "4". Apparently, Estonians' satisfaction with public sector e-services is quite justified: according to the Information Society Benchmarking Report 2004 (http://europa.eu.int/information_society/eeurope/i2010/docs/benchmarking/051222%20Final%20Benchmarking%20Report.pdf), Estonia ranks fourth among the EU-25 in terms of fully interactive services.
The survey reveals that the majority of internet users find public sector e-services useful: the respondents mostly outlined that the use of e-services saves time (78%) and enables to obtain necessary information from a state agency faster than usual (65%). 38% of the respondents found that public e-services enable them to save money.

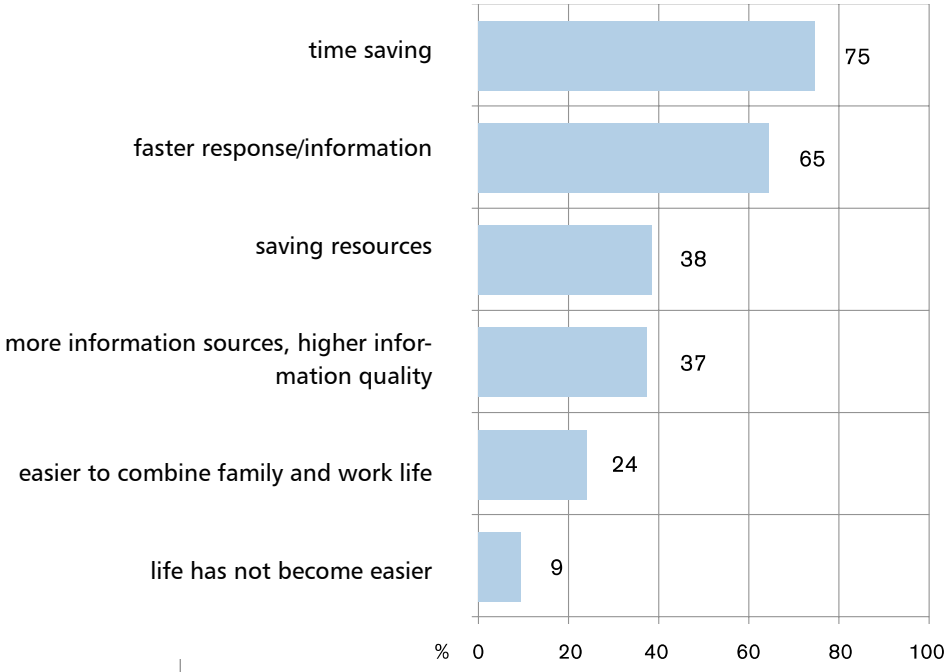


Figure 6. Usefulness of e-services (% of those using the Internet).

According to the survey, Estonians use the internet mostly to make use of public sector e-services and to search for financial information (to pay for public services and submit the income tax declarations). Medical information is another popular search target – 41% of the respondents had looked for medical information in the internet. As regards education, the internet is mainly used for submitting entrance papers to educational institutions, registering for courses (20% of users) and communicating with the school and teachers (19%). As to other fields, mostly e-services related to geodetic and topographical information are used.

In addition, the expectations of respondents in terms of developing new public e-services were examined. The results revealed that, first and foremost, people expect new services in the field of social and health care: more than half of internet users anticipate new services related to job-seeking, social benefits and health care services.

5. IT-RELATED LEGISLATION IN 2005

In terms of IT-related legislation, the year 2005 was rather stable. Amendments to the Personal Data Protection Act and the Databases Act adopted in 2004 have entered into force and serve the goals set. The state and local governments are reorganising data and connecting their databases to a secure web-based technical and technological environment for data exchange. Agencies administrating basic and national databases that are important from the point of view of exercising public authority have connected most of their databases with X-Road by now and are currently developing and launching data services necessary for the public and private sector.

Act on Databases of the State Information System

One of the drafts under elaboration is the Act on Databases of the State Information System which aims to update the current Databases Act so as to establish an integral state information system.

The current Databases Act regulates the establishment and maintenance of state databases. However, the present regulations no longer meet the needs and possibilities of the modern information society and hinder, thus, often the introduction of new IT solutions. Therefore, a new regulation taking into account the changed circumstances is needed.

The current act regulates, first and foremost, the establishment and maintenance of databases. The development of databases, however, has come to a stage, where these are the processes, i.e. data acquisition and data exchange processes, that matter most. This means that data exchange between information systems, and e-services between the citizen and the state agency, the entrepreneur and the state agency, as well as inter-agency e-services and those between one information system and another one have become a priority. The present act, however, does not regulate or sometimes insufficiently regulates the abovementioned processes.

In order to implement new IT solutions and take into account the needs of the society, a new draft act has been elaborated that preserves the successful outcomes regulated by the current act but also creates legal prerequisites for developing the state information system further into a single virtual data environment. This approach supports the IT solutions already applied or under implementation, such as the common data exchange layer (X-Road), the Citizen Portal, the IT environments for civil servants and entrepreneurs, the administration system for the state information system, etc.

The elaboration of the new act was started already two years ago. It has been a lengthy process, as the field of databases involves many stakeholders – nearly all state agencies. Conflicting interests have brought about heated discussions and debates and this has made it quite complicated to find a solution that would be optimal in terms of developing an integral state information system.
Compared to the current act that regulates the process of establishing databa-ses, the main amendments are targeted at regulating data services and their use. Moreover, requirements will be established to the subsystems under the state information system in order to enable the state information system function as an interoperable whole.

The following gives an overview of the main principles and scopes of application of the new act.

1. The state information system is an integral whole and databases form an important component of that whole, instead of being separate independent "bits". The act does not only regulate the life cycle of a database, but lays emphasis on its communication with other components of the whole.

2. Transition from database-oriented approach to service-orientation and from agency-orientedness to process-centredness.

The present Databases Act includes provisions on the classification and establishment of state databases. However, the current act is insufficient when it comes to data exchange between different institutions. Moreover, it does not at all regulate the provision of data services, which is one of the key prerequisites for the performance of public duties. In order to amend the regulation, the present approach oriented towards areas of government should be replaced by process-centred approach integrating areas of government.

Therefore, the new act serves to ensure the approach integrating areas of government and the integrity of databases. This will be achieved by using the support systems for the state information system, and by regulating the policy of service provision and usage as well as by strengthening the co-ordination of databases and related processes. Given the growing importance of the co-ordinating function in integrating administrative areas, the draft act also stipulates the responsibilities of the state agency co-ordinating the state information system, namely the Ministry of Economic Affairs and Communications.

3. Definition of basic data instead of classification of databases

Instead of classifying databases, the definition of "basic data" is introduced. The present act, which includes the classification of databases, does not really enable to differentiate between them; based on the classification of the databases, only the establishment procedure varies. The new draft act does not include such classification but defines "basic data" instead. Basic data are data that must be used in other information systems and databases. These are data that are generated by respective processes in the respective database and that other databases must not reproduce themselves, but must obtain from the "source". This aims to ensure the authenticity of data in data processing.

4. Data services free of charge for the public sector

The use of data services for performing public duties imposed by law is free of charge and the costs of providing such services are included in the state and local government budgets. This is to avoid a situation, where some registers would charge other state agencies for using data services although they are entitled to use these data for performing duties imposed by law. The purpose is to create prerequisites for the establishment of an integrated information system that would exclude administrative interests (i.e. the objective would be to raise the quality of data, not to create fee-charging services). There should be a single charging policy: to provide services free of charge for the widest possible populations of users.

Services may be charged only in accordance with the State Fees Act.

5. Extension of persons' rights to access data

Every person has the right to access data gathered about him or her into databases and information on consultation of his or her data. This provides a mechanism for improving the quality of data and ensures the person's rights to the protection of personal data and privacy. Moreover, it disciplines the performers of enquiries, as every enquiry is identifiable.

6. Unifying the administration of databases

The new draft act discards the definitions of "chief processor" and "authorised processor" of databases. Databases have administrators, who are responsible for all operations related to the database. Database administrators need not delegate database maintenance, but they are allowed to do that, if necessary, to the extent appropriate for them (e.g. in providing accommodation services, data processing, data acquisition, etc.).

The distinction between chief processors and authorised processors in the current act has brought along a situation, where the definition of the "authorised processor" is sometimes inexpedient and forced, as one and the same state agency often performs both duties.

7. Expansion of the functionality of the state register of databases

In its current form, the state register of databases performs its functions only partly. The new act expands its functions to a great extent – the state register of databases would become part of a support system, namely the administration system for the state information systems (RIHA).

8. Reduction of bureaucracy in the use of data

The new act excludes concluding bilateral data use agreements between state agencies. The agreements to join the data exchange layer X-Road, which among other things defines the user groups for whom services are automatically accessible, will be sufficient. Such approach will considerably reduce the bureaucracy related to data exchange and simplify data exchange processes.

The above principles form a part of the key principles imposed by the new act.

Personal Data Protection Act

The Personal Data Protection Act was first adopted in 1996. The new wording of the Personal Data Protection Act came into force on October 1, 2003 and the amended version, which took into account also circumstances rising from the EU accession, was adopted on May 1, 2004. The present Personal Data Protection Act can be regarded sufficient to protect individuals from the misuse of their personal data and to provide civil servants, individuals and entrepreneurs with various data services. In order to map the problems that arose in the course of implementing the act, an expert group was established in 2005 to analyse the Personal Data Protection Act and draft necessary amendments.

Electronic Communications Act

The Electronic Communications Act was adopted on December 8, 2004 and it came into force on January 1, 2005. The regulation of electronic communications and the Electronic Communications Act have been prepared on the basis of the directives of the new regulation since May 1, 2004 when Estonia joined the European Union and undertook to fulfil all requirements arising from the Community law.

The Electronic Communications Act adopted on January 1, 2005 did not enhance regulation but reduced it instead. For example, the regulation of engaging in economic activity related to electronic communications was simplified, the amount of necessary permits was reduced, and the automatic obligations of entrepreneurs holding a significant market share were abolished. Instead, the Communications Board may impose concrete duties on the basis of the actual market situation by indicating and explaining how a respective obligation can improve competition.

Directive on privacy and electronic communications

The regulations on data protection have seen further improvements as their importance is growing along with the fast development of electronic communications services. Namely, the directive on privacy and electronic communications (2002/58/EC) has been adopted within the framework of the new electronic communications directive. The directive on privacy and electronic communications regulates data protection in the field of electronic communications. Given the present situation, this means that the directive on privacy and electronic communications should be viewed together with the directive 95/46/EC on the protection of personal data that regulates issues related to electronic communications not covered by the directive on privacy and electronic communications. As in Estonia, the issues related to personal data are regulated by the Personal Data Protection Act, which includes the provisions of the directive 95/46/EC, the requirements of the above act should also be followed in electronic communications unless stated otherwise in the Electronic Communications Act.

6. IT DEVELOPMENTS IN MINISTRIES

6.1 MINISTRY OF EDUCATION AND RESEARCH

In 2005, considerable attention was paid to the creation and development of information systems in the Ministry of Education and Research (MER), of which three development projects in particular deserve to be highlighted: the Estonian Research Information System (ERIS), the Estonian Educational Information System (EHIS), and the Admissions Information System (SAIS).

ERIS - Estonian Research Information System

In 2004, the Ministry of Education and Research together with major Estonian research institutions launched a project aimed at the development of a central research information system (ERIS). The objective of ERIS is to consolidate R&D-related information into a systematic whole so as to enable better use of resources and improved decision-making both at strategic and operational level. The information system will serve, on one hand, as a source of information both for educational institutions and the general public and, on the other hand, as a tool for using, handling and administrating different information, procedures and services.

Until today, collection of R&D-related information has been unregulated in Estonia. Data of varying quality have been preserved in paper archives or in separate databases and information systems functioning on different platforms. Research institutions, agencies financed from the state budget as well as the ministry all maintain their own databases, but the interoperability between them is either poor or non-existent.

ERIS does not aim at the corporation of existing databases, but at the creation of a single integral solution meeting the needs of all stakeholders. Despite the fact that ERIS will serve as a common data environment, it will be possible to divide the system virtually, that is to say, to use it either as a state, local or personal information system. Owners of data will be able to choose whether to disclose their data or not, R&D institutions will have an additional possibility to encrypt confidential data. User environment, its functionality and access to data are based on the personal identification code and determined by user roles and user rights. Users are authorised either with the national ID card over the X-Road authorisation environment or via authorisation servers of research institutions.

ERIS will contain information about R&D institutions, individuals and groups of persons active in the field (expert groups, reviewers etc.), R&D projects as well as funding allocated for their implementation, and about the outcomes of R&D (publications, patents, co-operation proposals, products, services etc.). Information will be entered in ERIS either directly by its users, via information systems of different organisations (e.g. personnel management systems of universities, the information system of the Tallinn Technical University etc.) or through systems connected with ERIS (INNOPAC, EHIS, the Population Register).

The following operations will be performed in ERIS beginning from its launch in 2006: funding and evaluation of R&D, applying for the entry in the register by R&D institutions as well as proceeding these applications and signing contracts. ERIS will provide various possibilities for state institutions and agencies financed from the state budget to verify and process data they have submitted. In addition, the system will facilitate decision-making processes by allowing the notification of applicants about different procedural stages and decisions.

ERIS comprises two portals: the Estonian Research Portal directed at wider public and the personalised user desktop. The Estonian Research Portal, to be administered and moderated by Archimedes Foundation (www.archimedes.ee), will contain general information about R&D in Estonia as well as about international co-operation in the field. The portal will also include a calendar of research events, deliver recent R&D news, and provide a public thematic forum. It will allow making enquiries to the information system about the following topics: research institutions and their fields of activities, services provided by R&D institutions and co-operation proposals, funding allocated by state institutions, completed and ongoing projects, researchers and their publications, and registered patents. The Research Portal will provide an authorised access to the Estonian Research Information System. The functionality of the personalised desktop, its services and one's rights in the information system are determined by user rights and user roles. Researchers can delegate their roles, while maintaining responsibility for the entitled person's activities.

The integration of data into a common database will contribute to better decision-making in the field of R&D and reduce considerably the administration and development costs of respective information systems.

EHIS – Estonian Education Information System

The EHIS project was launched in 2002 and the system became operational in 2004.

EHIS consists of five sub-registers:

- sub-register of documents certifying general and gymnasium education;
- sub-register of teachers;
- sub-register of pupils, students and resident physicians;
- sub-register of educational institutions;
- sub-register of curricula and education licences.

The two main objectives behind the development of EHIS were:

- to provide reality-reflecting information for all decision-making levels (MER, county governments, local governments etc.) in order to make appropriate management decisions in the educational system;
- to provide automatic access to personal data for all stakeholders, who need it for the performance of their duties (e. g. Health Insurance Fund, Social Insurance Board).

Since June 2005, all pupils and students, whose data are maintained in EHIS, have an access to it via the citizen portal. In addition, a public view has been developed for EHIS, providing information about educational institutions and their curricula.

In October 2005, cross-usage between EHIS and the Population Register became operational, ensuring that data in EHIS are synchronous with that of the Population Register. As a result,

schools and local governments can now check their students' place of residence as entered in the Population Register – information that is of vital importance from the viewpoint of funding the education. Educational institutions no longer have to submit their statistics on paper, as national educational statistics will be compiled on the basis of EHIS data. This will lead to savings both for educational institutions and for the Statistical Office of Estonia.

In order to meet the second objective of EHIS, interfaces with the Social Insurance Board and the Health Insurance Fund have been developed in the X-Road data exchange environment. At the end of 2005, X-Road based data exchange was launched also with credit institutions issuing study loans. In the near future, X-Road based interfaces will be developed with the Federation of Estonian Student Unions (in order to verify the status of ISIC and ITIC cards) and the Defence Resources Board.

SAIS - Admissions Information System

SAIS is an electronic service allowing applicants to submit their admission documents through the internet to higher education institutions and to facilitate admission procedures in universities.

Since applicants can log onto SAIS through the citizen portal either with the national ID card or through internet banks, there is no need for separate registration. Everyone, who logs in, is therefore identified and all the data and applications submitted through SAIS are equivalent to that submitted on paper or by other means. In addition, SAIS is connected to databases in other countries, and when data exists, it is not necessary to prove past education, state examination grades, previous higher education grades, etc. Even if the data does not exist in other registers, a pre-filled application form can be submitted to SAIS, with which evidence is presented to one higher education school regarding the correctness of the missing data (for instance, a previous higher education diploma). It is enough to present evidence to one higher education school, since once it is entered in SAIS, and the data confirmed by one higher education school, applicants cab submit the information with admission applications to other higher education schools interchangeably with data received from state registers.

SAIS simplifies and accelerates the admission process, since school notices about offers of study places reach applicants electronically, and at the same time, applicants can accept or reject a study place through the system. If an applicant rejects a study place, it is possible to offer the study place to the next applicant on the ranking list almost immediately.

6.2 MINISTRY OF JUSTICE

IT-related activities in the Ministry of Justice proceed from the general priorities of the ministry, such as combat against crime, ensuring economic circulation and smooth case management.

In the field of IT, the most remarkable achievements in 2005 included:

1. implementation of the new version of the electronic Land Register;

2. carrying out an analysis on the IT architecture and technological trends of information systems in the field of legal protection and its approval by the Government of the Republic;

3. implementation of the system of distant court sessions;

4. establishment of the Centre of Registers and Information Systems.

Implementation of the new version of the electronic Land Register

The development project aimed at the upgrading of the electronic Land Register was launched in 2003 with an objective to implement, beginning from January 2006, an information system with up-to-date architecture in all land registry departments. The activities carried out in 2005 were related to the development of new software, the execution of data migration and the implementation of the system. The technological speciality of the solution lies in its multi-layered service-based architecture that simplifies the connection of different systems and realisation of changes.

Analysis on the IT architecture and technological trends in the field of legal protection

In September 2005, the Government of the Republic approved a document called „An analysis on the IT architecture and technological trends in the field of legal protection", elaborated in co-operation between the Ministry of Justice, Ministry of Interior, Estonian Police Board and the consulting firm PricewaterhouseCoopers. The document provides for the elaboration of annual action plans, responsibility for the implementation of which is assigned to an expert committee consisting of representatives of the Ministry of Economic Affairs and Communications, Ministry of Justice, Ministry of Finance, and Ministry of Interior. The main tasks of the expert committee will the following:

1. to elaborate and approve annual action plans on the development and implementation of the integrated workflow system eRecord;

2. to make proposals for the planning of necessary budgetary funds in the state budget;

3. to ensure that budgetary funds are used for intended purposes;

4. to organise the linking of other information systems in the field of legal protection with the workflow system eRecord;

5. to approve technological standards and basic objectives of the workflow system;

6. to facilitate communication between state agencies and co-ordinate project management.

All ministries must proceed, in the development of information systems related to legal protection, from the principles of the afore-mentioned document. At the centre of its concept lies the service-based information system eRecord, which registers important procedural information in criminal, misdemeanour, civil, and administrative proceedings, and provides data services for other information systems and services.

Implementation of the system of distant court sessions

At the beginning of 2005, the first distance court session was held in Estonia: prisoners, who had applied for release before the prescribed time, participated in the session through video conference, while actually being in prison. The distance court session system was implemented, as a pilot, in the Harju County Court and Murru prison. In the future, the system is planned to be implemented also in other courts and prisons.

Establishment of the Centre of Registers and Information Systems

The IT organisation of the Ministry of Justice has reached a stage, where major changes must be introduced. By 2005, all IT-related activities have become centralised, allowing thus increased savings and improved sustainability. At the same time, there is a danger that the ministry might become unnecessarily overloaded with support actions, the development and maintenance of IT included. Thus, in 2006, the Centre of Registers of the Ministry of Justice will be merged with the ministry's IT division. The name of the new unit will be the Centre of Registers and Information Systems of the Ministry of Justice. The main objectives behind these changes are the following:

1. To concentrate the ministry's activities more on its ministerial functions, in particular:

   - to ensure a more uniform organisational culture by sharing similar values;
   - to approximate the professional background and working methods of the ministry's employees;
   - to define the ministry as an instrument implementing the minister's policy, where employees have a clear understanding of its objectives and implementation measures of that policy;
   - to ensure a more uniform external image for the organisation.

2. To increase the efficiency of working processes in the ministry's field of administration:

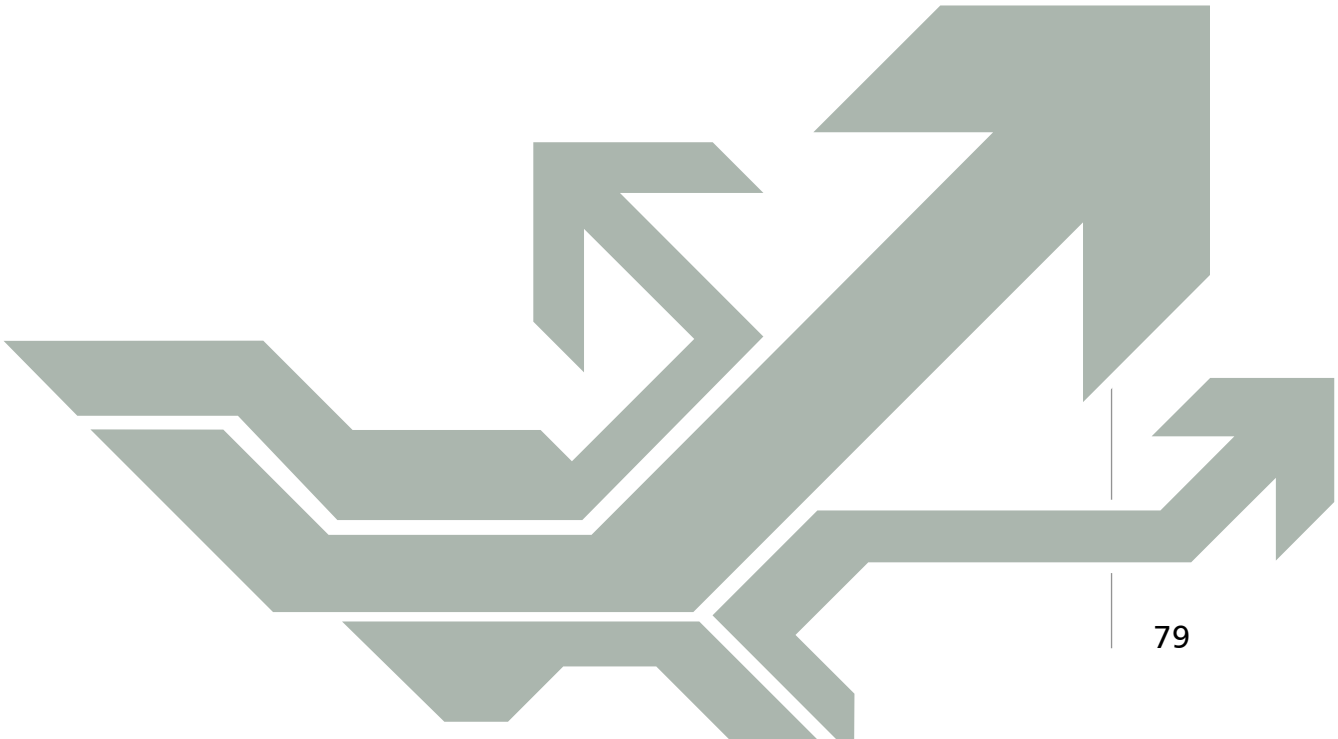
   - to free the top management from making individual IT-related decisions in the following fields: conducting procurement procedures, ensuring the reliability of information systems, hiring and selecting personnel, etc.;

- to accelerate the performance of IT-related activities by using highly qualified personnel;
- to reduce duplication in the ministry's field of administration;
- to provide faster and more efficient services to the ministry's field of administration, other agencies in the field of legal protection, as well as to citizens.

3. To reduce the size and share of the public sector in the state, including:

- to enable, in the management of IT personnel, the use of more flexible management methods than set out in regulations governing the civil service;
- to ensure certain self-regulation for the IT organisation in order to better respond to changes in the amount of work, turning certain part of the organisation's constant expenses into variable expenses.

The main field of activity of the new centre is the development and administration of registers and information systems as well as provision of IT-related services.



6.3 MINISTRY OF ECONOMIC AFFAIRS AND COMMUNICATIONS

In the Ministry of Economic Affairs and Communications, one of the most important IT projects in 2005 was the development of the geoinformation system and the system of address details of the State Register of Construction Works.

Development of the geoinformation system of the state Register of Construction Works

In the course of the project, a geoinformation system that will function as a part of the state Register of Construction Works (EHR-GIS) will be developed. This will be a real-time information system containing spatial data of buildings (on a scale 1:2000, 1:1000 and 1:500) and data concerning restrictions and limitations on buildings. The objective of the EHR-GIS is to consolidate and collect data about locations of constructions subject to survey, surveyors and survey results, to archive this data and to prepare them for use.
The information system will exclude the possibility to issue building permits for areas, where construction works are prohibited. In addition, the system will enable optimum planning of building locations, excluding thus the possibility to plan constructions in unsuitable locations, of inappropriate size or with improper purpose of use.

The system will enable real-time publication of data concerning buildings as well as restrictions and limitations on them, allowing thus to decide, in a commonly understandable manner both for the public sector and other interested parties, upon the possibility to construct at a certain place.

The users of the system will include surveying and planning companies, officials of local governments, users of the Register of Construction Works, as well as other users of information systems that exchange data with it. The publication, on the map, of data related to geodetic investigations and restrictions and limitations proceeding from constructions allows to publish the following data:

- data concerning the exact location of a building and handling of such data;
- location of geodetic investigations and respective additional data;
- limitations on construction works (protected zones);
- joining the (technical) spatial data of buildings with databases and information systems that process data concerning restrictions on buildings (e.g. register of cultural monuments);
- search for construction works by their technical data and address details as well as by their purpose of use;
- search for construction works or surveys by specified location-based characteristics; limitations on construction works and performing search for different restrictions and limitations;
- displaying the technical data of buildings on an electronic map for the users of the

Register of Construction Works – both for the public sector and all other interested parties;

- search for geodetic investigations, archiving of results by surveying metadata and publishing of such data;
- uploading and downloading of output files related to geodetic investigations or planning, as well as the respective data processing (integration) and archiving;
- preserving the archiving characteristics of investigations for the identification of original documents;
- use of basic maps or orthophotos of the Estonian Land Board as a background for the register's data;
- entry of co-ordinate data concerning EHR objects that correspond to the agreed format in the database.

Thus, all interested parties will understand in an unambiguous manner, where and with which parameters buildings can be constructed. In addition, owners of utility networks and those submitting geodetic data must have the opportunity to submit digital map material about geodetic investigations related to buildings. The EHR-GIS must enable:

- to register data concerning geodetic investigations so as to increase the quality of decision-making on the safety and use of buildings;
- to use, over the web, the data of the Register of Construction Works, including data concerning geodetic investigations;
- to collect and submit data about buildings for statistical purposes;
- for local governments and other institutions, to obtain and handle data about buildings in order to ensure the performance of their functions according to the Building Act;
- for individuals (including authorized persons), to submit geodetic data and documents to local governments electronically and with a digital signature;
- for local governments, to obtain data and documents submitted to them electronically and with a digital signature by individuals;
- for surveying companies, to submit data concerning geodetic investigations to local governments electronically;
- to exchange data, by way of cross-usage, with the Land Information System of the Land Board;
- to exchange data, by way of cross-usage, with information systems of highway owners and to allow the highway owners to submit their data to local governments electronically;
- for authorized users in local governments, to mark building locations on the basic map;

- for authorized users in local governments, to keep count of and collect data on geodetic investigations conducted on the territory of a local government, submit archiving characteristics of investigations, and process such data;

- for the main user of the register, to develop user interfaces for its organisation.

Development of the system of address details of the State Register of Construction Works

The objective of the project is the development of an integral system of address details, which will allow all interested individuals to access the address details of buildings. In addition, the implementation of the project will bring along increased efficiency for local governments and state agencies both internally and in their communication with citizens and businesses.

7. ANNEXES

7.1 IT CONTACTS IN PUBLIC ADMINISTRATION AGENCIES

Name of the agency	Contact	Phone/mobile phone	E-mail
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Chancellery of the Legal Chancellor	Kertti Päeva	(+372) 6938434	kertti.paeva@oiguskantsler.ee
Public Prosecutor's Office	Raul Meriloo	(+372) 6139413	raul.meriloo@prokuratuur.ee
Supreme Court	Jaak Sitska	(+372) 730 9047 (+372) 51 29 417	jaak.sitska@nc.ee
State Audit Office	Markko-Raul Esop	(+372) 640 0794 (+372) 50 74 755	markko-raul.esop@riigikontroll.ee
State Chancellery	Ülle Laur	(+372) 6935 844 (+372) 51 09 949	ulle.laur@rk.ee
Ministries			
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Ministry of Defence	Mihkel Tammet	(+372) 7170189	mihkel.tammet@kmin.ee
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Ministry of Agriculture	Jaanus Kuusler	(+372) 6256111	jaanus.kuusler@agri.ee
Ministry of Finance	Sven Rea	(+372) 6113070	sven.rea@fin.ee
Ministry of Internal Affairs	Urmo Kalamees	(+372) 612 5046 (+372) 50 22 733	urmo.kalamees@sisemin.gov.ee
Ministry of Social Affairs	Allan Poola	(+372) 6269299	allan.poola@sm.ee
Ministry of Foreign Affairs	Malle Ling	(+372) 6377330	malle.ling@mfa.ee
National Boards			
Security Police Board	Edgar Reindla	(+372) 6121422	edgar@kapo.ee
Citizenship and Migration Board	Agu Leinfeld	(+372) 6126980	agu.leinfeld@mig.ee
Competition Board	Jüri Rosenvald	(+372) 6803963	jyri.rosenvald@konkurentsiamet.ee

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Civil Aviation Administration	Tiit Soorm	(+372) 6676678	tiit.soorm@ecaa.ee
Land Board	Kalle Arula	(+372) 6650625	kalle.arula@maaamet.ee
Road Administration	Andrus Kross	(+372) 611 9314 (+372) 56 641 208	andrus.kross@mnt.ee
Tax and Customs Board	Lauri Laksberg	(+372) 6303910	lauri.laksberg@emta.ee
National Heritage Board	Urve Russow	(+372) 6403012	urve.russow@muinas.ee
Patent Office	Asko Laurson	(+372) 6277 901	asko.laurson@epa.ee
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Police Board	Virgo Riisipapp	(+372) 6123301	virgo.riispapp@pol.ee
Agricultural Registers and Information Board	Olaf Laurisson	(+372) 7371230	olaf.laurisson@pria.ee
Rescue Board	Andres Selli	(+372) 628 2016 (+372) 50 16 112	andres.selli@rescue.ee
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Public Procurement Office	Ly Rootslane	(+372) 7374140	ly.rootslane@sam.ee
Communications Board	Maret Kaadu	(+372) 6931101	maret.kaadu@sa.ee
Social Insurance Board	Teet Kallaste	(+372) 6208356	teet.kallaste@ensib.ee
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Health Care Board	Ljudmila Labzina	(+372) 6509853	ljuda.labzina@tervishoiuamet.ee
Labour Market Board	Eve Kislov	(+372) 6257730	eve.kislov@tta.ee
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Maritime Administration	Alar Siht	(+372) 620 5580 (+372) 50 43835	alar.siht@vta.ee
Inspectorates/Centres			
Data Protection Inspectorate	Henri-Paul Ariste	(+372) 627 4135 (+372) 52 52608	henri@dp.gov.ee
Estonian Motor Vehicle Registration Centre	Aldo Tatter	(+372) 6201324	aldo.tatter@ark.ee
National Examination and Qualification Centre	Alland Parman	(+372) 6454565	alland.parman@ekk.edu.ee
Energy Market Inspectorate	Margus Kasepalu	(+372) 6201900	margus.kasepalu@eti.gov.ee
Estonian Environmental Information Centre	Raivo Vadi	(+372) 6962232	raivo.vadi@kki.ee

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Plant Production Inspectorate	Martin Rand	(+372) 6712650	martin.rand@plant.agri.ee
Technical Inspectorate	Kristjan Kuru	(+372) 694 9417 (+372) 50 98 368	kristjan.kuru@tji.ee
Health Protection Inspectorate	Maie Otsmann	(+372) 6943540	maie.otsmann@tervisekaitse.ee
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7.2 PUBLIC ADMINISTRATION IT CONTACTS IN IT DEVELOPMENT

Organisation/position	Field of responsibility	Name	Phone / mobile phone	E-mail
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Ministry of Economic Affairs and Communications / Adviser on IT matters	eEurope 2005, ENISA	Mait Heidelberg	(+372) 625 6410	mait.heidelberg@mkm.ee
Tallinn Technical University / Professor of knowledge-based systems	IT security, Northern eDimension	Jaak Tepandi	(+372) 50 29 028	jt@tepinfo.ee
Ministry of Social Affairs / Head of Health Information and Analysis Department	eHealth	Kaja Kuivjõgi	(+372) 626 9160	kaja.kuivjogi@sm.ee
Ministry of Education and Science / Adviser on IT matters	eLearning	Jaak Anton	(+372) 735 0135	jaak.anton@hm.ee
Ministry of Environment / Head of Information Systems Department	eEnvironment	Vahur Eenmaa	(+372) 626 2830	vahur.eenmaa@ekm.envir.ee
Ministry of Economic Affairs and Communications / Head of Development Division; Department of State Information Systems	IT architecture and interoperability of information systems (IDA programme)	Uuno Vallner	(+372) 639 7635	uuno.vallner@riso.ee
Ministry of Economic Affairs and Communications / Head of Internal Coordination and Foreign Cooperation Division, Department of State Information Systems	General EU coordination in the field of information society; benchmarking and EU programmes	Karin Rits	(+372) 639 7649	karin.rits@riso.ee
Archimedes Foundation / Programme Coordinator	National contact point for eContent and eTEN programmes	Tarmo Pihl	(+372) 730 0329	tarmop@archimedes.ee
Ministry of Economic Affairs and Communications / Executive Officer of the Development Division, Department of State Information Systems	EU structural funds	Urmas Raude	(+372) 639 7661	urmas.raude@riso.ee
Tiger Leap Foundation / General Manager	Tiger Leap programme	Enel Mägi	(+372) 655 0230	enel@tiigrihype.ee
Ministry of Economic Affairs and Communications / Adviser to the Minister on IT matters	IT matters in general	Andrus Aaslaid	(+372) 625 6429	andrus.aaslaid@mkm.ee
Ministry of Economic Affairs and Communications / Head of Analysis and Planning Division, Department of State Information Systems	IT budget management	Rein Kauber	(+372) 639 7645	rein.kauber@riso.ee

Estonian Informatics Centre / Area Manager of the Development Department	Administration system of state information systems	Riina Kivi	(+372) 663 0212	riina.kivi@riso.ee
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Estonian Informatics Centre / Head of Management Department	Development of e-services, X-Road administration	Riho Oks	(+372) 663 0290 (+372) 50 12 418	riho.oks@ria.ee
Estonian Informatics Centre / Head of Department of Infrastructure	Backbone network of the state data communications; administration and development of data communication network services	Margus Kreinin	(+372) 663 0220	margus.kreinin@aso.ee
Estonian Informatics Centre / Content Administration Manager	Administration and coordination of the eCitizen portals	Anu Veidenberg	(+372) 663 0208	anu.veidenberg@ria.ee

7.3 USEFUL LINKS

Department of State Information Systems: http://www.riso.ee/en/
Ministry of Economic Affairs and Communications: http://www.mkm.ee/
State Chancellery: http://www.riigikantselei.ee
Estonian Informatics Centre: http://www.ria.ee/atp/eng/
Estonian Tax and Customs Board: http://www.emta.ee/
Estonian Land Board: http://www.maaamet.ee/
Estonian Data Protection Inspectorate: http://www.dp.gov.ee
Estonian National Communication Board: http://www.sa.ee

Estonia Educational and Research Network: http://www.eenet.ee
eGovernance Academy: http://www.ega.ee/
Look@World Foundation: http://www.vaatamaailma.ee/
Archimedes Foundation: http://www.arhimedes.ee
Tiger Leap Foundation: http://www.tiigrihype.ee
Estonian Information Technology Society: http://www.eits.ee/
Estonian Information Technology Foundation: http://www.eitsa.ee/
Association of Estonian Information Technology and Telecommunication Companies: http://www.itl.ee
IT College: http://www.itcollege.ee/
Estonian eUniversity: http://www.e-uni.ee/main.php

eCitizen portal: http://www.eesti.ee/
eGovernment portal: http://www.riik.ee/en/
eDemocracy portal TOM: http://tom.riik.ee
Use of ID cards: http://www.id.ee/
Passport and ID card: http://www.pass.ee/2.html
Sertifitseerimiskeskus AS: http://www.sk.ee
Business portal: http://www.aktiva.ee
Centre of Registers: http://www.eer.ee