INFORMATION SOCIETY YEARBOOK 2009

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Foreword

JUHAN PARTS,
Minister of Economic Affairs
and Communications

The world is becoming more and more complicated every day as knowledge and opportunities increase constantly, providing ever more directions to choose in our challenging environment. Historically, humans have had to focus on many different strategic resources: elemental forces; sheer human power; raw materials; financial capital and energy. Our modern knowledge-based information society is centred on the use of information and technology in the best way possible.

Now we have not only public sector IT applications and eGovernment, but we can also observe the growing importance of information and communication technologies in our daily lives, education and economy. For this reason the title of our annual yearbook has also changed from IT in the Public Administration of Estonia. Yearbook to The Information Society Yearbook, covering different areas and aspects of the Estonian information society in the public, private and tertiary sectors.

Victor Hugo said that progress never happens in only one single stage. Similarly, developments in the information society in 2009 grew out of existing circumstances, and will serve as a basis for future success stories. However, the under-use of resources that could enhance Estonia's economic competitiveness is a cause for concern. The business sector makes little use of ICT. Companies are not making the breakthroughs that could lead other sectors to new levels of quality. Exports of IT developments are relatively low. This all means that there are plenty of challenges still ahead.

In 2009, the European Union reported on developments in the information society in recent years and drew up an action plan for the next few years so as to ensure that the information society has a positive impact on the competitiveness and sustainability of the European economy and the welfare of European citizens. The whole world has realised that society needs communication networks to be kept as up to date as possible.

For Estonia, the year 2009 marked the start of a new era of internetisation with the launch of the EstWin project, which aims to take the internet and data communication networks to a whole new level, with next-generation broadband networks offering much faster data transmission speeds. By designing a core infrastructure that boosts regional development, we are also creating a supportive environment for the development of new and innovative services.

We have contributed to the implementation of information and communication technologies with domestic and EU funds. In 2007–2013, 980 million kroons of structural assistance will be channelled towards information society development. The year 2009 witnessed a record number of new development projects, granting ever better opportunities for people to participate in the information society while prioritising the speed, user-friendliness, reliability and security of information.

Enjoy reading!

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1.1.1.
eINCLUSION IN THE LOCAL GOVERNMENTS OF ESTONIA

KRISTINA REINSALU
kristina.reinsalu@ega.ee
eGovernance Academy

eInclusion may be defined as the use of the opportunities offered by information and communication technologies in order to make exercising public authority more transparent, comprehensible and inclusive for the society. Estonia has very good preconditions for communication with the public authorities as regards the country's general technological progress, Internet penetration and user skills. However, the options for inclusion in discussions and decision-making are still scarce. eInclusion is more likely to materialise at local government level, where the need for that is also bigger and where the decisions that directly concern people are made faster, which is also why timely notification and inclusion are more important. Local government websites, which have been developed and regulated for over ten years now since the adoption of the Public Information Act in Estonia, are a useful tool for practicing democracy at local level, but there is still room for improvement.

eInclusion allows to make exercising public authority more transparent and inclusive for the society.

Given the significance of local governments in the development of eDemocracy in Estonia, the eGovernance Academy concentrated on eInclusion in local governments by conducting a survey to evaluate their websites[1]. As the year 2009 was the year of elections, the focus was on iVoting and the election online campaigns of local governments. The main focus of the survey was on the user logic and simplicity of these sites, while their compliance with the Public Information Act was also evaluated. In addition, the survey addressed the web disclosure of the work cycle and work logic of councils, which are the most important local government units.

The following gives an overview of the estimates of eInclusion and the current situation in that area. A target survey was carried out among local governments with 83 respondents from local governments and 145 from citizens' associations and also individuals. 67% of the respondents said that the main objective of a local government website is to inform its residents about its decisions and duties, while 10% considered inclusion

Local government websites are found to be too complicated and the information hard to find or outdated.

in discussions and decision-making most important. 27% of the local government representatives claimed that eInclusion is on the agenda in their local governments and that they are prepared for that, whereas 18% admitted that the issue has never been put forward in their governments. That websites are vital information channels and potential channels for eInclusion is testified by the fact that surprisingly many (17%) citizens and citizens' associations representatives visit local government websites every day. At the same time, citizens are quite critical about the websites, as around 30% of the respondents find them to be too complicated and the information hard to find or outdated. The survey analysed all the Estonian local government websites, and the main evaluation criteria were user and community friendliness, the information available about the work of the councils, and the availability of interactive communication tools.

The eGovernance Academy has studied the user-friendliness and interactivity of local governments in previous years as well[2]. As regards user-friendliness in 2009, it can be said that there has been considerable progress since 2006 with the introduction of comprehensive site maps and search engines. However, only a few local governments also provide content in lan-

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1   The research has been financed by the Norwegian Financial Mechanisms and the National Foundation of Civil Society. For further information see http://www.ega.ee.

2   In 2006, the National Audit Office and the eGovernance Academy prepared a joint report on information society in the Estonian local governments. Although the report primarily mapped the information technologies available in local governments, it also identified the potential channels for bilateral communication. The report revealed that 58 local governments in Estonia had a functioning forum. There were also 56 guestbooks on the websites, and 27 sites were holding opinion polls on different subjects.

guages other than Estonian, or the possibility to order news by e-mail. Giving consideration to the up-to-dateness of the websites, which may be a motivating factor for site visitors, there are many local governments who, deciding by their websites, appear to have no newsworthy topics to report. The content, wording and structure of information often raise questions. One reason for inadequate information is that the responsibility for the content has been divided between people holding very different positions. The solution is to let the experts in relevant fields manage the relevant content.

As already noted, councils are the most important local government bodies. Therefore, it should be easy to monitor and contribute to their work. In spring 2009, only 27% of the local governments in Estonia offered the option of monitoring and contributing to the process of drafting council regulations. It should at least be possible to send inquiries to council members and to have access to draft documents before the stage of decision-making. Slightly over 50% of the local governments and 75% of the cities have displayed the contact information of council members on websites. In many cases information about the membership of council members in political parties or election coalitions is not available either. Less than half of the local governments comply with the requirement to provide access to councils' draft legislation on their websites. Even if available somewhere, in many cases easier access should be provided, so that citizens would not have to search for documents in different document registers. Now that communication portals are gaining more popularity, local governments should introduce also more innovative tools of communication. Unfortunately, there is not much progress in that area, as only a few cities and rural municipalities broadcast council sessions on their websites.

Councils are the most important local government bodies and their work should be easy to monitor.

In fact, the number of interactive web tools has shrunk since the last such survey three years ago. For instance, the number of guestbooks, which are often used for expressing one's concerns, has declined from 18% to 9%. Forums are more widespread, but their number is also dropping according to the survey: at present only 12% of the rural municipalities and 21% of the cities have a forum on their websites (it used to be 25% and 33% respectively). Many local governments argue that forum comments are often personally offensive and that the quality of discussions is poor. Unlike the editors and publishers of online news portals, who have taken different measures to manage the content of comments, public authorities have chosen an easier way out by closing their forums. Fortunately, there are also rural municipalities and cities where citizens and officials have joint and fruitful debates in website forums. For instance, the rural municipality of Mäksa has a forum with clear objectives, terms and conditions (e.g. citizens' inquiries are responded to within 48 hours), which are usually also adhered to. The most important thing is that forums should have moderators and that the representatives of local governments would actually be actively involved. The majority of Estonian local government forums, however, are passive and useless as such.

Objectives and terms and conditions should be set for forums.

One of the most active cooperation channels for discussing local matters is the *frequently asked questions* interface on local government websites. The difference with mail or e-mail communication is that the public can have an understanding of the concerns of other people and how local authorities have addressed these concerns. The website of the City of Tartu, for instance, has an efficient functional interface *Ametnik vastab* (The official responds), and the cities of Elva, Haapsalu and Pärnu have applied similar positive solutions, but that is also where the list ends.

The under-utilisation of high-quality technical resources in the development of democracy and inclusion is illustrated by the analysis of information available on websites about the local government elections in 2009. 162 local governments had created special sub-sites for elections, which generally included only logistical information on how to get to the polling stations and on their opening hours. Procedural information about the elections and references to relevant local government regulations were scarcer. More substantial information, such as even the names of the candidates, was available only on around 50% of the websites (107), and even there the only additional information was the candidates' membership in political parties. A couple of dozen of websites offered more background information about the candidates (education, profession, etc.), while most of them presented these data through an active link to the website of the National Electoral Committee. This is a perfectly reasonable solution, as there is no need to re-enter that information once it is already available somewhere else. Another good example is the website of the rural municipality of Saue, which featured a separate topic to introduce the candidates and which had further links to the websites of the parties and election coalitions, where information about all the candidates, their political parties or coalitions and programmes could be found.

The analysis of information about the local government elections pointed to the under-utilisation of technical resources.

Regrettably only eight local government websites had posted the programmes of parties and election coalitions, so that it could be easily found too. True, parties' programmes are available on their websites, whereas information about election coalitions is difficult to find or not available at all. For the better functioning of the information society, data should also be available through cross-usage, and maximum two clicks away from the citizen. Only a couple of websites had special election forums that provided also opportunities for actual participation. Two websites had links to blogs, where some discussions about the elections could be found. No other innovative tools were noted.

When dividing eInclusion into the stages of provision of information, consultations and interactive communications, the majority of the Estonian local governments are still in the first stage; that is, the provision of information. It only remains to be desired that all the opportunities of that stage be used effectively. For instance, introducing freeware programmes for web analyses would allow to easily identify the origin of website visitors and their movements, and to carry out searches on the sites. eInclusion can be boosted also by adding content in languages other than Estonian, especially in regions of non-native speakers. New social networks, such as blogs or Facebook, should be made more use of, as they offer a more informal platform for discussions and additional information on local governments. Then links to the official websites of local governments would be necessary too, otherwise the amount of users of such information would be very limited.

In conclusion we can say that while the Estonian civil society has made rapid progress in recent years with numerous signing petitions, and national garbage collection and brainstorming campaigns organised through the Internet, local governments should also make better use of ICT to be more visible, transparent and inclusive for all citizens.

More use should be made of new social environments, such as blogs or Facebook.

1.1.2.
IT IN SUPPORT OF CITIZEN INITIATIVES

ANNELI OHVRIL
anneli@minueesti.ee
Let's Do it! My Estonia

The "My Estonia" brainstorming sessions in spring 2009 are evidently one of the most talked-about civic initiatives in Estonia, which received also extensive media coverage. The sessions have included numerous talks, writings and discussions on the tasks and the current situation of civic initiatives, on the essence of democracy and the possibilities of representative and participatory democracy, with several examples of civic initiatives, at both local and national level, highlighted to the general public.

Brainstorming sessions as such are very characteristic of civil society – people come together to discuss issues they are concerned about, to find solutions, to consider them thoroughly and both to implement them themselves and to introduce them to others. This is a direct way of participating in the formation of public policy.

A more recent phenomenon is the organisation of actions encompassing the entire country. These have become a reality owing to the development of information technology. It has established a common ground for the joint action and thinking of vast masses and created possibilities for so-called real democracy, where everyone is able to use their knowledge and experience to contribute to developing and shaping the society. The development of IT has made it very simple; for example, it is possible to submit ideas through the osale.ee portal, which is already a manifestation of inclusive democracy. This alone, however, does not suffice. It lacks synergy, which can unfold only in conversations, discussions and merging experience. This allows us to speak about a strong civil society making use of the common knowledge of its citizens. As a result, it is possible to formulate one of the most relevant underlying ideas of the brainstorming sessions: information technology is to be treated as a handy tool for giving rise to synergy and not as a means of channelling communication.

Information technology is to be treated as a handy tool for giving rise to synergy and not as a means of channelling communication.

"My Estonia" drew together some twenty people wishing to find motivated citizens all around Estonia with whom to join forces and launch a strong community-based civil movement outside political hierarchies.

It goes without saying that the brainstorming sessions reinforced communities in the entire country. Although there exist numerous well-functioning communities in many parts of Estonia, the sessions nevertheless helped find new impetus and people sharing the same ideas. Strong local communities form the basis of a strong civil society. The majority of the ideas proposed in the course of the brainstorming sessions,[3] be them, for example, new services in communities or other initiatives based on joint action, form another means of strengthening civil society.

The advantage of the brainstorming sessions lay in drawing together different people, strangers to each other.

The brainstorming sessions of May 1 can in many places be viewed as the birth of a well-functioning community. The comments following the sessions were often dominated by participants' cheerful wonderment as to why it has taken so long to come together and discuss problems collectively – the positive experience received allows to expect such meetings and joint actions will continue in many places.

Preparations for and the implementation of the brainstorming sessions is a very good example of intersectoral collaboration. Just like in the case of the 2008 clean-up campaign, tens and tens of organisations were involved in the preparations, from the public, business and also the third sector, all of them being top players in their field. The majority of organisers of the brainstorming sessions were volunteers, which contributed to the development of volunteering culture in Estonia and to obtaining and spreading the respective experience.

From the point of view of inclusion, it is very important that the sessions introduced and tested the open room method. The method is so far not very widely known and used in Estonia, but it is very suitable for involvement in the case of more complex issues lacking an explicit solution, so the latter needs to be reached in the course of discussions. The advantage of the open room method is that if a large amount of people wishing to find a solution come together, the solution will be found.

A direct benefit for participants is the experience of discussion culture, which is very important in civil society. Though there is nothing new in joint thinking and plan-making in itself, this usually takes place in a company of people thinking alike, be them, for example, friends, colleagues, schoolmates or members of the same non-profit organisation having similar backgrounds, knowledge and experience. The brainstorming sessions, on the other hand, drew together different people, strangers to each other, and that was a great advantage. This gave rise to the need to present and substantiate one's standpoints, to listen to others and consider their opinion, to find a common ground in order to render a result. We believe that for many, this was a new experience to see that although it is complicated to reach a common decision in the course of democratic discussions, it is nevertheless possible.

In addition to actual experience and skills, the brainstorming sessions help shape democratic attitudes and views, increase social capital and empower their participants. All these are real assets to the development of civil society.

The reaction of foreign media to the efforts made in Estonia was also very positive. Enquiries and questions flooded in from different parts of the world. Following our footpath, Lithuania is organising the second round of brainstorming sessions and Ukraine is about to launch the first one.

As a result of the experience received from organising the projects "Let's do it!" and "My Estonia", there is a new structure emerging that enables, by means of involvement and enlivenment of our civil society, to implement positive changes in the society. However, it is important to bear in mind that information technology, the almighty one, will never be able to replace real-life conversations between people and actions arising from such discussions. What took place on 1 May could never have occurred merely in an electronic environment.

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3   See http://www.minueesti.ee/?&lng=en

1.1.3.
"MY ESTONIA": NEED-BASED PUBLIC AND COMMUNITY SERVICES

GEROLI PEEDU
geroli@minueesti.ee
Network of Estonian Non-Profit Organisations (EMSL)

Efficient delegation of public services to citizens' associations allows to increase the quality of services, to promote citizen participation and cooperation between citizens and public authorities, and to strengthen the sustainability of associations and communities. This is necessary to improve the quality of life and to ensure viability and social cohesion in different regions of Estonia, which is gaining increasing importance, given the declining number of inhabitants and the resulting drop in the income base of local governments in most of the regions.

Currently, the responsibility for offering public services lies with local governments, but in the future communities and local governments could provide some of the services jointly. The *My Estonia* brainstorming session carried out under the "Let's Do It!" initiative in spring 2009 produced a number of ideas. Some of them have already been implemented, while others require more in-depth analysis, involvement of experts and also financial resources.

The Network of Estonian Non-Profit Organisations (EMSL) together with the Estonian Design Centre and pilot users from the city of Viljandi and the rural municipality of Vigala launched a project "My Estonia: Public Services. Seven at a Blow" in order not to put these ideas on hold until better times arrive. The project aims to promote cooperation on public services between local governments and citizens' associations, and to introduce and spread the principles of user-oriented design of public services.

Delegating public services

A public service is a good or a benefit provided by government or local government to perform the public duties and to serve the public interest. In accordance with § 6 of the Local Government Organisation Act and specific laws, the functions of a local government include the organisation, in the rural municipality or city, of social assistance and services, welfare services for the elderly, youth work, housing and utilities, the supply of water and sewerage, the provision of public services and

amenities, waste management, and so on. The responsibility for the availability of these services lies with local governments, but this does not mean that the must provide all the services themselves.

A service should be offered by someone who is most able to do it, for instance citizens' associations, to whom a local authority may delegate the provision of a service. Contractual delegation of a public service means that a local authority (government or local government) can assign the provision of a public service to a legal person in private law, while retaining control and responsibility over provision.

A public service is a good or a benefit provided by government or local government to perform the public duties and to serve the public interest.

At this point, 60% of the local governments in Estonia have delegated some of their public services, but there is potential for more. Partly, this is due to insufficient knowledge: citizens' associations lack knowledge of what kind of public services they could offer, while being innovative, so as to motivate local governments to include them. Local governments also have limited knowledge of what kind of services to delegate and what are the local communities in the relevant region.

On the other hand, citizens' associations are often not strong enough in organisational terms to provide public services and to be reliable and sustainable partners to local governments. For a local government responsible for the availability of services, it is certainly easier and safer to offer the services through state officials, municipal agencies or companies, which, however, translates into unused potential.

The advantage of associations is that as they are closer to service users, they are also better aware of their needs, professional competence and openness to innovation. Unlike the business sector, associations can concentrate on non-profit work and, compared to the public sector, they can act faster and more flexibly. They also have more opportunities to include additional resources, such as voluntary work, donations or external funding. A survey by the Praxis Centre for Policy Studies showed that 87% of the local governments prefer to delegate the provision of services mainly because associations can use funding from different sources.

The advantage of associations is that as they are closer to service users, they are also better aware of their needs.

The Good Citizen information gateway[4] contains practical information, examples, and questions-answers

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4   http://www.ngo.ee

about the delegation of public services. The portal enables local governments to find potential service providers and citizens' associations to establish contacts with local governments and with providers of other similar services across Estonia. The website offers useful information and recommendations, while raising awareness of and improving skills for delegating public services.

Designing public services

Electronic channels make public services easier, cheaper and more effective to offer and use, but only if the electronic representation of a service is not a mere duplication of the paper world, but reflects conscious design and user-oriented approach. With the *Seven at a Blow* project we want to demonstrate how to design a public service in the partnership of the local government, the design team and local people, the daily users of services.

A user-oriented design process includes potential service users and a design team already in the concept phase. In the design process we will address questions like: Who is the target group of the service? Is it viable to automate the service? What are the best channels for providing the service, and are there any alternative channels?

A user-oriented design process includes potential service users and a design team as early as in the concept phase of the service.

To give positive examples of innovative and user-oriented services, we will design seven public services and software solutions that are based on the ideas proposed in the *My Estonia* brainstorming session. The design team will include the authors of these ideas and local governments, will analyse the input received and also the world practice, and continue with the design and prototype of the services. These resulting public services will be a practical example of using information technologies for delegating and providing services.

The project is funded by Iceland, Lichtenstein and Norway through the EEA and Norwegian financial mechanisms.

Selected ideas for making life easier, proposed at the *My Estonia* brainstorming session:

- **A mobile local government:** Travelling local government officials that offer public services, such as filling in forms, accepting documents, or giving consultations. Creating the opportunity to monitor the official's route via an electronic channel and order their visits, including from guest visitors (e.g. from Enterprise Estonia, the Unemployment Insurance Fund) based on locals' needs.
- **Improving the infrastructure:** Identification of local shortcomings by communities, monitoring developments, and making proposals for how to improve the infrastructure (roads, the Internet, electricity, shops, public transport, the medical system).
- **Mapping the living environment:** Mapping of points of interest and relevant background information together with the option of making amendments and comments, and adding illustrative materials (e.g. photos, videos, schemas). Designing of hiking routes that can be printed on paper, downloaded to a phone or used for making information stands, for instance, with the help of local youth centres.
- **Organising bees:** Bringing together people who have time and willingness to participate in bees.
- **Helping families in need:** Designing of a website with information about families in need. For instance, construction materials with small defects could be given to those in need instead of throwing them away.
- **Transport services:** People driving to rural regions offering transport to others. Establishment of call centres or hotlines to bring together those who offer transport and those who need it, while providing state compensation to the former.
- **Mapping the graves of the Brothers of the Cross of Liberty:** Set-up of an interactive database on the website of the National Defence League to map the location of the graves and short biographies of the buried.
- **Cooperation environment:** A service to join local non-profit organisations in finding rooms for rent, accountants, etc.
- **Monitoring the work of local council members:** Establishment of an online environment that would contain all the decisions and draft legislation of local council members.

1.1.4.
QUALITY OF LIFE AND CIVIC INVOLVEMENT IN INFORMATION SOCIETY

PILLE PRUULMANN-VENGERFELDT
pille.vengerfeldt@ut.ee

MARGIT KELLER
margit.keller@ut.ee

KRISTINA REINSALU
kristina.reinsalu@ut.ee
Institute of Journalism and Communication, University of Tartu

The concept of information society has mostly positive connotations in texts intended for the general public. It has been widely used in the media, politics and social sciences (an overview of the debate in Estonian is provided by Kanger 2007[5]). In a way, extensive exploitation of the concept has led to it having no explicit, unambiguous and measurable meaning. Numerous documents, including future visions of Estonia, view the application of information and communication technologies as an economic growth engine and a contributor to the development of democratic civil society. On the other hand, it is evident that information technology has infiltrated the daily life of a vast amount of households and become part of their quality of life. At the same time, several studies point to a gap between the expectations of the society and the actual implementation of ICT tools.

The application of information and communication technologies is viewed as an economic growth engine.

People are not very enthusiastic about applying ICT possibilities for the benefit of the civil society; rather, they tend to use ICT as a means of consuming entertainment services, finding information and networking. In other words, the Internet is used to improve their personal quality of life and to satisfy their daily needs. This raises the question of the role of the consumer and the citizen. The first one is traditionally linked to passive, non-critical enjoyment and the satisfaction of personal needs, whereas the second one lies in active, society-minded responsibility beyond narrow personal interests (see Gabriel and Lang 2006[6]). Today's complicated society has been referred to as global risk society (see Beck 2005[7]), where the development of science and technology generates not only benefits, but also unforeseeable side-effects, such as environmental pollution, health risks caused by food additives, or cyber-bullying among children. Thus, the borderline between the consumer and the citizen is becoming increasingly vaguer: by consuming both tangible goods and also the intangible products and services of the info and media field, people constantly take civic decisions, which affect not only their own life quality but also that of people living in very distant places. Whether and to which extent they are aware of the substance and impact of their decisions is a separate question.

Internet usage across various nation groups

The 2008 study "Mina. Maailm. Meedia" (in English "Me. The World. Media") shows that for the first time since records began in Estonia, the activity of Internet usage is statistically considerably higher among women compared to men. 55% of women and 46% of men have used the Internet during the past six months. Age-related stratification continues to prevail, and it is conspicuous not only when looking at the percentage of users, but also when analysing the online activities of different age groups (see Figure 1). Thus, actual digital stratification does not occur only in the form of users and non-users, but derives in many respects from different usage possibilities and their application.

Actual digital stratification does not occur only between users and non-users.

Variances in activities are especially visible when we compare Internet users of different age (see Figure 1). Younger people's online behaviour is for the most part characterised by networking with friends and acquaintances, looking for entertainment and information on work and studies, whereas middle-aged users tend to focus on Internet banking and e-services, looking for in-

5   Kanger, L. (2007). Infoühiskonna määratlemine: kriitiline teooriaülevaade. Magistritöö, Tartu Ülikool, ajakirjanduse ja kommunikatsiooni instituut (http://mail.jrnl.ut.ee:8080/282/)

6   Gabriel, Y., Lang, T. (2006). The Unmanageable Consumer. London: Sage

7   Beck, U. (2005 [1986]). Riskiühiskond. Teel uue modernsuse poole. Tartu: Tartu Ülikooli Kirjastus
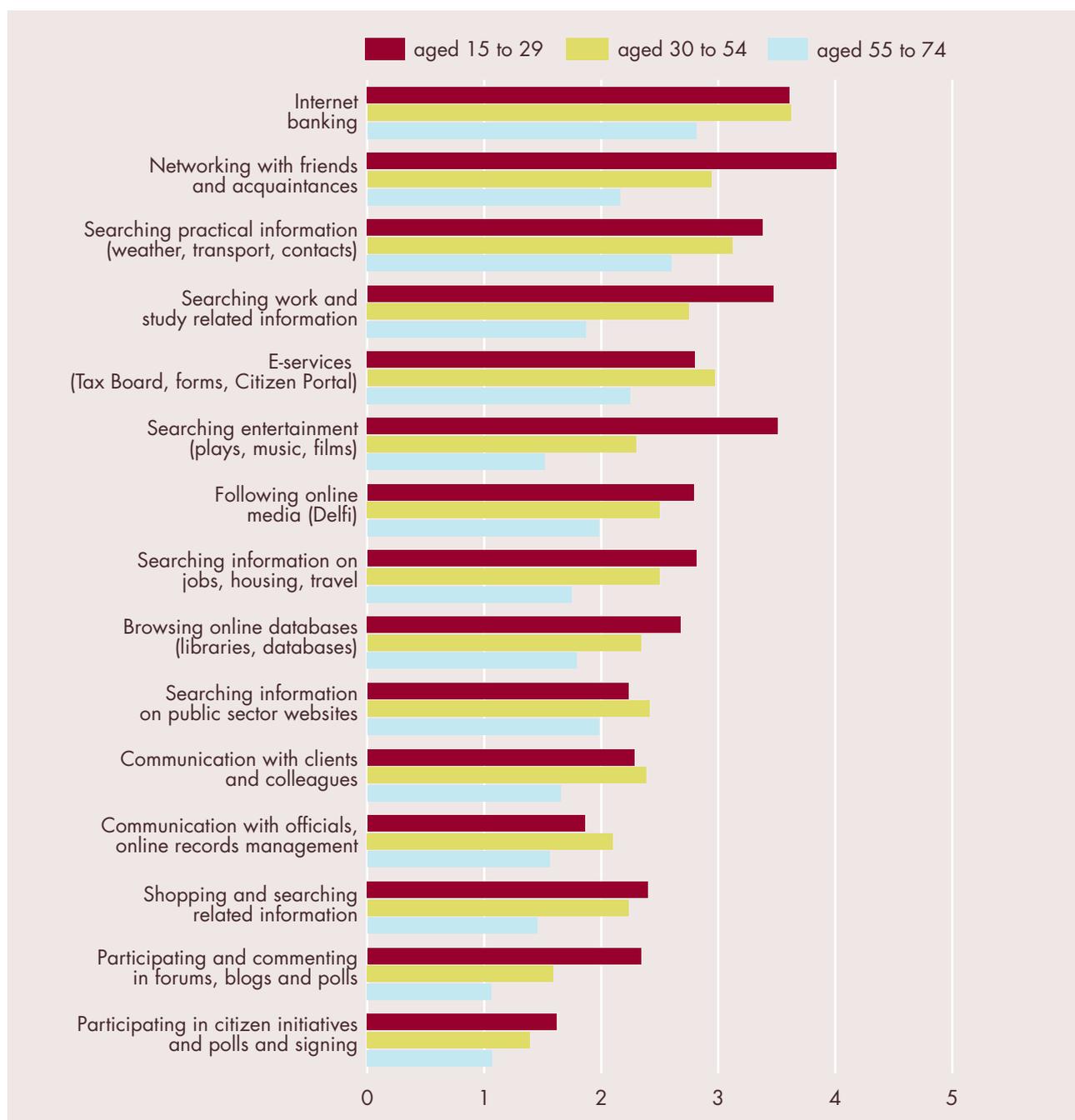
FIGURE 1. To what extent do the activities listed here characterise your Internet usage? Age group averages (on a scale from 5 or "very much" to 1 or "not at all")

Source: "Mina. Maailm. Meedia" 2008

formation on state agencies and work-related communication. Part of the disparities is due to the different lifestyle of the young – they do not have so much work-related communication, because they are still studying, and they also have no income to declare. Nevertheless, it can be claimed that Internet usage for personal welfare varies across age groups in several aspects.

Internet usage continues to expand in Estonia, so it is increasingly more important to comprehend its versatility. Studies of Internet users show that although the number of possibilities offered by the Internet has hiked over the past six years, the main interests of users – information and entertainment – have remained the

same. What matters is that one or the other of the two is dominating for the majority of the respondents and there are clearly different usage patterns taking shape.

Use of public e-services and participation in community life through the Internet as influencers of the quality of life in information society.

An assessment of the democratic potential of information and communication technologies shows that Estonia's position in the provision of e-services by both national and local governments is rather good in international comparison. However, as shown in Figure 1, the initiatives of the public sector have not always received a warm welcome and wide-spread implementation. A no-

tably larger part of people's daily online activities is related to services consumption and also entertainment, which may not necessarily lead to e-participation and growth in democratic citizenship. On the other hand, the role of the ease of use of the services offered by the state in the formation of Internet usage patterns should not be underestimated. Most of the e-services help save time and make processes simpler, so this is also an indicator of improvement in the quality of life. A more direct way how information technology impacts the quality of life in Estonia are, for instance, cases when a person does not find a job near home and can thus do remote work via the Internet. Thus, ICT may directly help solve specific social problems. There is no doubt that various institutions and local governments have many unused possibilities in this respect.

> *Continuous improvement in life quality via ICT is only possible by the active participation of well-informed, aware citizens who are familiar with governance processes.*

Instead of introducing transparency and inclusion, the main possibilities and benefits of Internet democracy, the approach prevalent in Estonia was official-centred, focusing on collecting as much information about citizens as possible in order to offer them suitable services. People had almost no say in discussions about these services, not to mention more thorough political debates. Since citizens are in such case considered as clients of services, not active participants in the decision-making process, the e-democracy implemented in Estonia tends to be so-called *Internet client democracy as actual participatory democracy* (see e.g. Bellamy and Taylor 1998[8]; Ridell 2002[9]).

It is important to emphasise that continuous improvement in the quality of life via ICT is only possible by the active participation of well-informed, aware citizens who are familiar with governance processes. To this end, various institutions should remarkably improve the presentation of daily information in their e-channels. Another important step in increasing citizens' e-involvement is upgrading the existing participation rooms and creating new ones, so that citizens and also officials could receive a real experience in discussion democracy.

> *The spheres of Internet and civic initiative are becoming increasingly more integrated in Estonia.*

Estonia's civic culture and grassroots initiatives have also been exploring possibilities of using the Internet to accomplish their goals. Several different campaigns have been organised both offline and online, pointing to an increase in the third sector and civic participation. Thus, the spheres of Internet and civic initiative are becoming increasingly more integrated in Estonia. Yet, it is important to distinguish between manifestations of spontaneous democracy and institutional participatory democracy. There have been some developments in the latter category, though. One example is the Internet portal osale.ee launched by the State Chancellery, which is a development based on the model of the TOM participation portal and features a rather lively discussion under the topic "Igaühe õigused e-riigis" (*Universal rights in the e-state*) (National Audit Office 2008[10]) created by the National Audit Office.

In the context of Estonia, the concept of information society will have a meaning only if it becomes more than the public sector's slogan for different initiatives. It will have substance if the latter is provided by citizens themselves with their actions and behaviour. The value of information society lies in actively participating citizens, not in people with a consumerist attitude to their daily life, passively awaiting ready-made applications.

8   Bellamy, C. and Taylor, J. A. (1998). Governing in the Information Age. Buckingham: Open University Press

9   Ridell, S. (2002). The Web as a Space for Local Agency. Communications, 27(2), 147–169

10 National Audit Office (2008). Igaühe õigused e-riigis. E-riigi harta. http://www.riigikontroll.ee/

1.1.5.
THE OPPORTUNITIES AND RISKS OF THE INTERNET FOR CHILDREN AND YOUNG PEOPLE

VERONIKA KALMUS
veronika.kalmus@ut.ee

PILLE PRUULMANN-VENGERFELDT
pille.vengerfeldt@ut.ee
Institute of Journalism and Communication, University of Tartu

Based on a general and somewhat simplified approach, the academic views on the impact of information society on children can be put on a scale with criticisers and child protectors at one side and optimists at the other side. The former construct the meaning of childhood through the keywords of *innocence* and *vulnerability*, claiming that children need special protection from the invasion of information society. Optimists, on the other hand, believe in children's natural development into competent users of the opportunities of information technology, constituting a new target group of active and competent media audience and consumers (cf. Buckingham 2000[11]).

Increased online opportunities for children also increase related risks.

There is often a thin line between online risks and opportunities, depending on one's viewpoint and values. While children may regard anonymity, privacy, games and perhaps even small scams as exciting opportunities, then adults predominantly perceive these as risks to children's safety. Banks and manufacturers are interested in offering various online services to children, whereas critical social theorists tend to see it as a misuse of children for commercial purposes or even as a violation of childhood innocence (see also Livingstone 2003[12]).

For media explorers and producers, legislators and public at large, risks to children in the modern media environment generally comprise pornographic, violent and racist content; content that contains incitement to hatred or self-mutilation; improper or potentially harmful contacts with strangers; intrusion of privacy; misuse of personal data; and cyber harassment between peers. The main online opportunities include entertainment, search for information, educational resources, communication, networking, creativity, games, and participation in civil society (Hasebrink et al. 2008: 24–25[13]). Existing literature (Livingstone and Bober 2004[14]) points to a serious dilemma: there is a strong positive correlation between the online opportunities used by children and the related risks. In other words, the increase in opportunities also raises risks, while scarce opportunities entail fewer risks. Unfortunately, it is not clear how to enlarge the opportunities while reducing the risks.

Estonian children are in the forefront in Europe for the share of Internet users.

Based on internationally comparable data for recent years, Estonian children are in the forefront in Europe for the proportion of Internet users. A survey among EU parents in October 2008 (Flash Eurobarometer 248; N = 12,750) revealed that 93% of the Estonian children aged from 6 to 17 use the Internet. With this, Estonia shares 2–4 places with the Netherlands and Denmark among 27 EU Member States, Finland ahead of them with only one percentage point (see Figure 1).

For parental awareness and surveillance, Estonia is consistently among the last ones in the ranking. Only 50% of Estonian parents talk to their children about what they are doing online (EU average is 74%).

Figure 1 illustrates Estonian parents' indifference and liberalism, not only in comparison with Southern European countries, where children's online activity is rather low yet where parents nevertheless often talk about the Internet, but also compared to Scandinavia and the

For parental awareness and surveillance, Estonia is among the last ones in the ranking.

United Kingdom, where children's online activity is as high as in Estonia. The attitudes and behaviour of Estonian parents are primarily comparable to other "new" European countries. For instance, in Estonia, the Czech

11   Buckingham, D. (2000). After the Death of Childhood: Growing up in the Age of Electronic Media. Cambridge: Polity Press

12   Livingstone, S. (2003). Children's Use of the Internet: Reflections on the Emerging Research Agenda. New Media & Society, 5 (2), 147–166

13   Hasebrink, U., Livingstone, S., Haddon, L. (2008). Comparing Children's Online Opportunities and Risks Across Europe: Cross-National Comparisons for EU Kids Online. London: EU Kids Online (Deliverable D3.2)

14   Livingstone S., Bober, M. (2004). UK Children Go Online: Surveying the Experiences of Young People and Their Parents. London: London School of Economics and Political Science
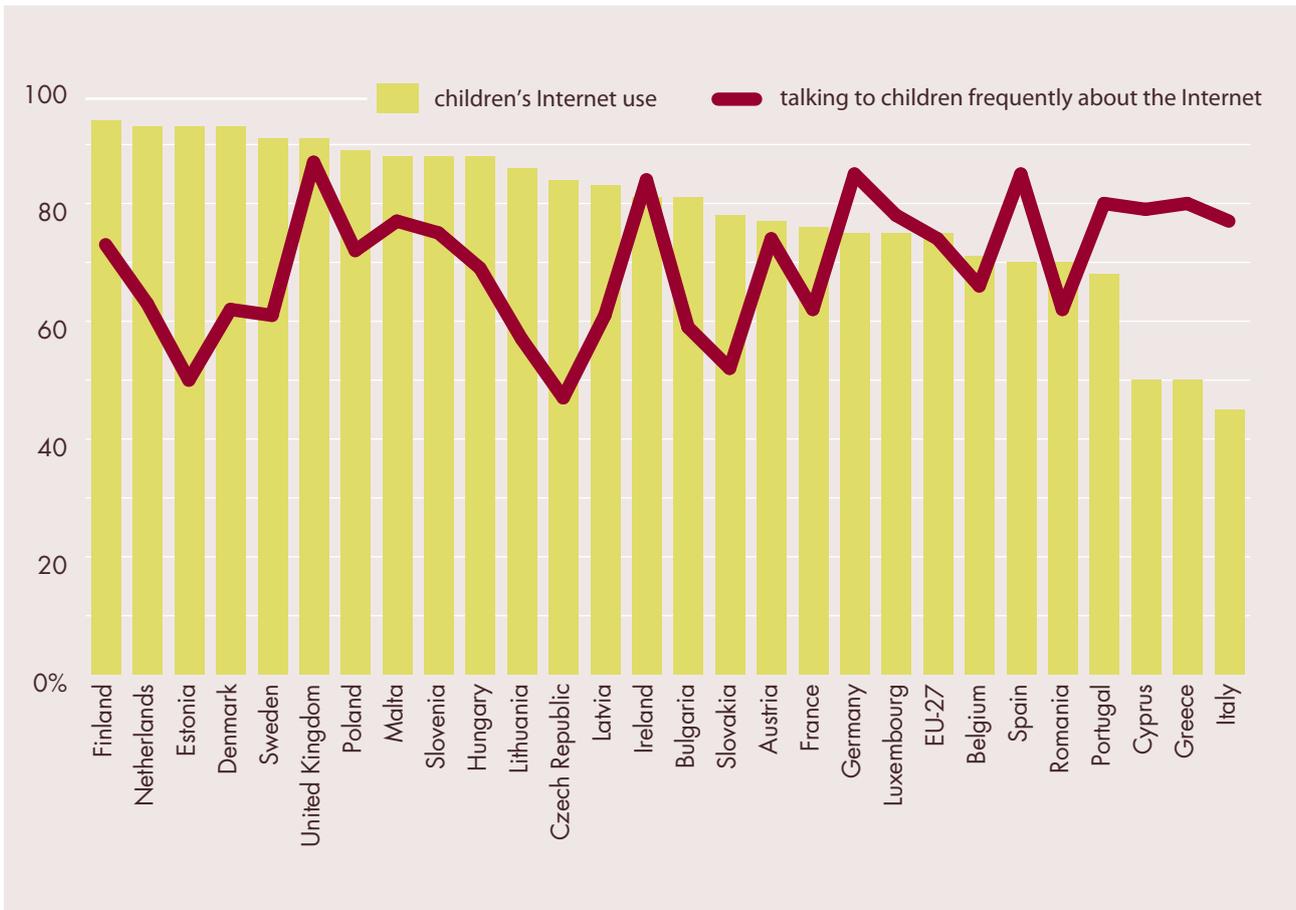
FIGURE 1. Percentage of Internet users in EU among children aged 6 to 17 and percentage of parents talking to children about online activities (% of parents of Internet-using children).

Source: Flash Eurobarometer 248, 2008

Republic and Slovakia the share of parents that do not allow children to talk to strangers online is the lowest at 61%, 62% and 63% respectively, while the EU average is 83% and Ireland's as much as 96%.

EU Kids Online has developed a classification of European countries based on the share of Internet users among children less than 18 years of age and the results of risk behaviour surveys (Hasebrink et al. 2008[15]). Estonia, the Netherlands, Norway and the United Kingdom are the countries with high children's Internet use and also high online risks. Unlike Estonian children, Dutch and British children can relatively well protect themselves from online risks, according to parent estimates. On the scale of parental surveillance, the Netherlands ranks high and the United Kingdom ranks medium (ibid.). Given all that, Estonian children appear to be in quite a unique position in European context. On one hand, they have been classified under the category "high use – high risk", whereas on the other hand they have been let loose in the web jungle, even though parents think they do not always manage to make it there on their own.

15 Hasebrink, U., Livingstone, S., Haddon, L. (2008). Comparing Children's Online Opportunities and Risks Across Europe: Cross-National Comparisons for EU Kids Online. London: EU Kids Online (Deliverable D3.2)

The Estonian young as Internet users and online content producers

Based on a population survey "Mina. Maailm. Meedia" (in English "Me. The World. Media") in 2008, the Estonian young generally assess their online skills highly. 13% of the respondents aged 15 to 19 assess their skills highly, 38% say their skills to be good, and 24% claim to have satisfactory skills. With these estimates, they surpass all other age groups, except the young aged 20 to 29. It is important to note that girls aged 15 to 19 give a considerably lower valuation to their computer skills then boys of the same age. 88% of the respondents aged 15 to 19 had used the Internet on the day of the survey or on the previous day; 7% had used it in the previous week and around 1% had been online less frequently. 81% of the respondents mostly use the Internet at home (daily), and much fewer at school (61% at least every week) or other places, such as at a friend's place or at a public Internet access point (43% at least every weak).

The future potential of Internet use lies in online content creation. Figure 2 compares the frequency of online content creation among the young aged 15 to 19 against all Internet users.

As with all new opportunities and services, online content creation is more popular with the young. The most popular activity is uploading of photos, both

users aged 15 to19   total Internet users

Creating content for one's
own homepage or blog

Uploading images-photos
to the Internet

Uploading videos
(Youtube, Toru)

Sharing music, films,
programmes (Bittorrent)

Searching/managing information on
friends-acquaintances in communication networks

Creating/changing one's own profile
in communication networks

Participating in forums
on topics of concern

Commenting on articles in Delfi
and online newspapers

Visiting playing environments
(Second Life, Warcraft, Mängukoobas)

0 10 20 30 40 50 60 70 80
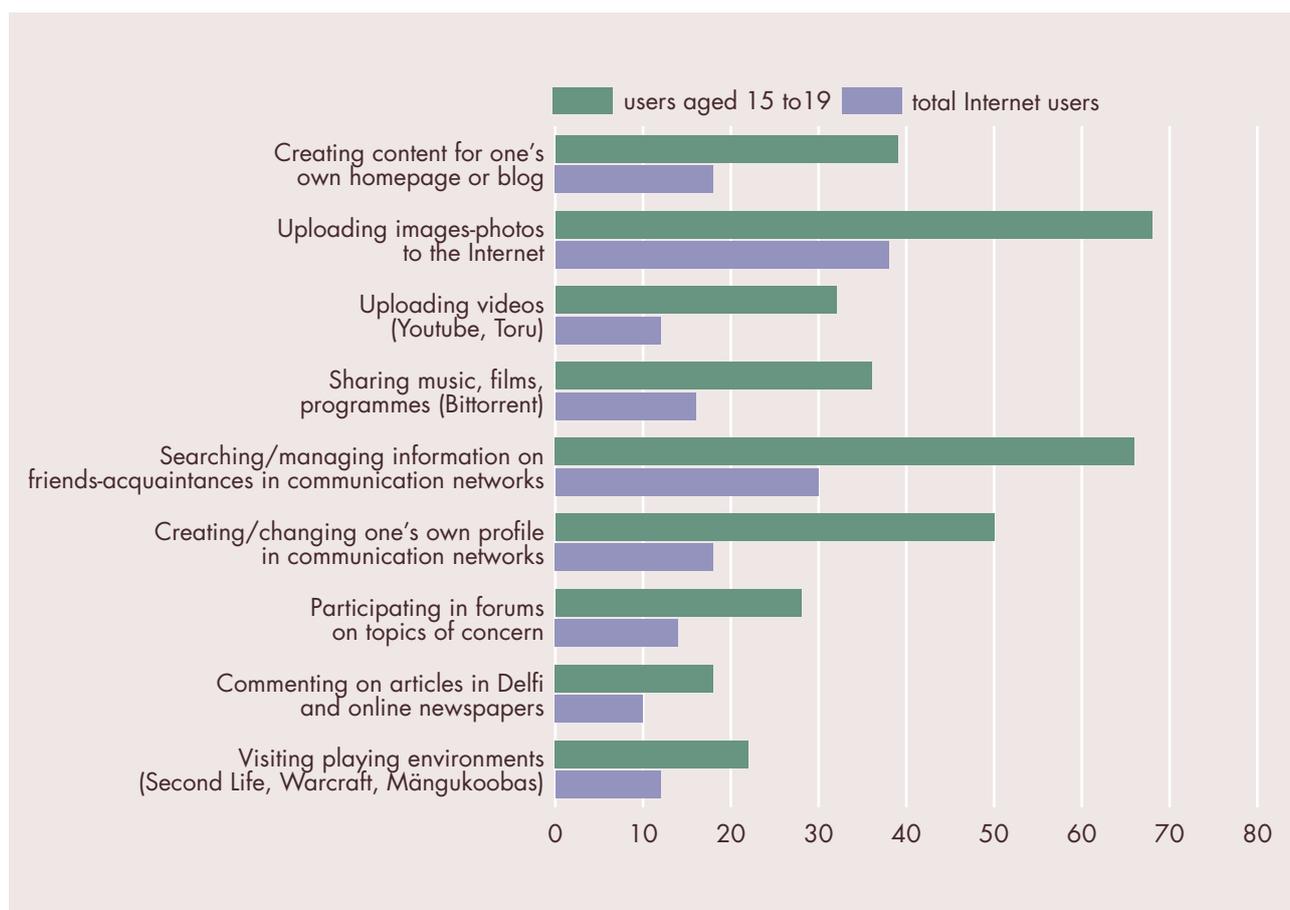
FIGURE 2. Percentage of "regular" or "occasional" online content creators among total Internet users and users aged 15 to 19.

Source: Mina. Maailm. Meedia (2008)

among the young and among Internet users in general. Searching information about friends and acquaintances in communication networks (Orkut, Facebook, Rate, Myspace, LinkedIn, etc.) ranks second in popularity. Somewhat surprisingly, commenting in the media portal Delfi and online newspapers is not very widespread, being even less popular than having a say in forums on topics of concern.

> *The Estonian young generally assess their online skills highly.*

Online content creation is currently considered to be an online service with the biggest potential. The richness and quality of Estonia's future online scene will be largely shaped by the ability of Estonian children and young people to create secure and conscious content. Andra Siibak (2009[16]) claims in her doctoral thesis that the present Estonian young are not motivated enough to produce innovative and creative web content. Instead of trying to change or re-interpret the existing values and increase democracy in the society, the Estonian young rather act as consumers of the Internet, and take old values and norms along to the new media environment.

Research shows that user preferences develop from simpler to more advanced ones (Kalmus et al. 2009[17]; Runnel 2009[18]). The first level of online activities of children and the young are related to information search and schoolwork, followed by entertainment and networking, which interests them more. The third level is related to technical and time resources, comprising watching and downloading films and broadcasts, and playing online games. Only the fourth level of online activities can be considered "advanced", as it involves content creation and interaction, and creates room for further democracy in public online environments. The progress of children and the young on the "ladder of online opportunities" (Livingstone and Helsper 2007[19]) can be further boosted also by media and civic studies.

16 Siibak, A. (2009). Self-presentation of the "Digital Generation" in Estonia. Dissertationes de mediis et communicationibus Universitatis Tartuensis, 7. Tartu: Tartu University Press http://hdl.handle.net/10062/10593

17 Kalmus, V., Runnel, P., Siibak, A. (2009). Opportunities and Benefits Online. Livingstone S., Haddon, L. (eds.), Kids Online: Opportunities and Risks for Children (71–82). Bristol: Policy Press

18 Runnel, P. (2009). The Transformation of the Internet Usage Practices in Estonia. Dissertationes de mediis et communicationibus Universitatis Tartuensis, 8. Tartu: Tartu University Press http://hdl.handle.net/10062/14292

19 Livingstone, S., Helsper, E.J. (2007). Gradations in Digital Inclusion: Children, Young People and the Digital Divide. New Media & Society, 9 (4), 671–696

1.2. Increasing awareness and improving skills

1.2.1.
EU STRUCTURAL FUND PROGRAMME "INCREASING AWARENESS OF THE INFORMATION SOCIETY"

AGNE KIVISAAR
agne.kivisaar@ria.ee
Estonian Informatics Centre

The general objective of the EU Structural Fund programme "Increasing awareness of the information society" is to increase awareness of the possibilities of the information society so as to contribute to the development of a society that would support people's life and activities and increase the efficiency of policy formulation in the field of information society through high-quality information and data usage. The total funding of the programme is EEK 50 million (EUR 3,125,000).

The target groups of the programme include consumers of both existing and future e-services as well as parties involved in the development of e-services, that is policy-makers, the public sector and entrepreneurs, whose increased awareness of the information society will increase general motivation for the take-up of ICT solutions. In addition, the programme focuses on raising the awareness of opinion leaders and media representatives, increasing interest in and forming more positive attitudes towards new technologies.

The programme is targeting consumers and developers of e-services.

In 2009, the programme focused on three action lines: promoting the State Portal eesti.ee, introducing the possibilities of the state information system and increasing awareness of information security.

Former surveys in Estonia have shown that the population's awareness of public e-services is low, representing a bottleneck in the development of Estonia as an e-state. In 2009, the opportunities of the State Portal eesti.ee[20] were introduced to the general public. In January, a month-long campaign "Gateway to eEstonia" was held, targeting citizens and service providers. The objective of the campaign was to increase users' awareness of the State Portal and to invite them to provide feedback on how to improve the website and make it more user-friendly. Service providers were informed about the essence of the portal and taught how to use it for easy provision of services to their users. 6,500 visitors responded to the feedback questionnaire about the portal. In the framework of the campaign, a development team, joined by 570 users, was formed for the State Portal. In addition, a communication strategy for the promotion of the portal was designed.

Changing people's attitudes and behaviour requires continuous awareness-raising.

The "Gateway to eEstonia" campaign was oriented to citizens and service providers.

In December 2009, the second phase of the State Portal's information campaign was launched. The second phase included modernisation of the State Portal's logo and raising the awareness of inhabitants of rural areas for whom the portal's e-services could be of particular benefit. A tour was organised to introduce the State Portal in eight Estonian towns. During the tour, portal-related games were organised and beloved Estonian pop artists Tanel Padar, Ivo Linna and Anti Kammiste entertained the public. One of the objectives of the campaign was to invite people to activate their eesti.ee e-mail address (Forename.Surname@eesti.ee), an official communication channel between the state and the citizen. Furthermore, a special website for the campaign[21] was developed.

During the campaign, the number of new users redirecting their official e-mail address grew nearly three times and the number of hits to the State Portal increased by 50% (from 6,500 hits to 10,000 per day according to Google Analytics). The latter remained high throughout the first four weeks.

The organisers of the campaign hope that now more Internet users in Estonia are familiar with the State Portal and will use the site for finding public e-services and information.

In 2009, the introduction of the state information

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20   http://www.eesti.ee

21   http://www.eesti.ee/kampaania (in Estonian only)

system included 40 training courses, four information days, two conferences, the first high-level information society training course, and publication of an IT yearbook "Information Technology in Public Administration of Estonia 2008". In total, over 1,500 people participated in the training courses and information days, aimed both at the public and private sector.

In the framework of "Smart eState", 24 training courses and four information days were organised. In 2009, the training courses primarily focused on information security and the implementation of a three-level baseline security system for information systems (ISKE). Training courses in semantics were held for the first time for different target groups and first training materials were compiled for public use. The information days involved many stakeholders and focused on most topical state information SYSTEM issues in 2009: development of IT, State Portal eesti.ee, electronic document exchange, and publication of data.

On 22 April 2009, conference "Justifications are not excused" was held for the decision-makers of public and private sectors in the facilities of the Tallinn congregation of the Pentecostal Church. The conference focused on three kinds of frequent barriers in the development of e-services: "technology does not enable", "legislation does not allow" and "there is no money".

On 26-27 November 2009, the first high-level information society training course was held in the Sagadi Manor for the leaders of the public and private sectors and the opinion leaders in ICT. The course aimed to introduce the essence and opportunities of the information society and find a common language between IT specialists and top executives. For the training course, a special play entitled "eState theatre", based on the methods of management theatre, was written and staged. The play focused on three main challenges related to e-services: changing of business processes, possibilities of subcontracting services, and development of user-centric services. Due to higher than expected interest, the "eState theatre" will be performed for large audiences at least three times also in 2010.

The interactive guide about the state information system is a promotional web material.

In addition, an interactive guide about the state information system was developed in 2009. This promotional web-based material was designed for public sector leaders to explain the functioning of the state information system. It is also useful for database developers and administrators, IT project managers, analysts, and media representatives.

One of the programme's priorities is to raise awareness of safe Internet use among individuals, public sector representatives and entrepreneurs. Under this action line more than 125 IT specialists received training.

On the Safer Internet Day in February 2009, a campaign was held to inform citizens of online risks.

Another campaign in autumn 2009 targeted parents, in particular mothers as caretakers of family, to increase their awareness of computer protection and pass this knowledge on to their families. The campaign gave mothers the message that they can protect their children and families against online risks, and a special website[22] was also set up. TV was used as the primary channel for communicating the messages of the campaign and for increasing awareness in general. Other means of communication included Internet channels, in particular social media and the eSchool application, and marketing. To achieve additional media coverage, a special guerrilla-philosophy based solution, a children's playground, was installed in the Kristiine shopping centre, a busy junction in Tallinn.

One of the programme's priorities is to raise awareness of safe Internet use.

Computer protection issues were addressed also in a security column of an IT related TV show "Ja pole-gi keeruline" (in English *It isn't difficult...*), broadcast in spring season 2009 on Kanal 2. Altogether five shows were recorded, 50 minutes each, on various topics from the creation of user accounts and passwords, virtual world in general, computer viruses, paedophilia and storage to the use of ID cards. A relevant website[23] was developed too.

On 24-25 September 2009, TF CSIRT held its 28th meeting in Tallinn. The meeting aimed to increase the target group's awareness of information society processes, and also introduced the opportunities of the EU ICT sector. Participants included foreign lecturers who carried out training courses for IT specialists, so that higher awareness of the information society would be coupled with increased practical skills and experience.

Plans for 2010 include continuing the series of training courses on the state information system, promoting the State Portal and raising awareness of information security.

22   http://www.netiohud.ee (in Estonian only)

23   http://www.japolegikeeruline.ee (in Estonian only)

1.2.2.
LOOK@WORLD FOUNDATION IN 2009

PIRET ARO
piret@vaatamaailma.ee
Look@World Foundation

In 2001, the most influential companies in Estonia established a foundation called Look@World with an objective to lead Estonians to the Internet. Within three years, the foundation fulfilled its ambitious goal to give basic computer and Internet training for 100,000 Estonians. In addition, 500 public Internet access points were opened and an eSchool system was developed, which has gained domestic and international recognition.

In 2006, EMT, Elion, SEB and Swedbank on one side and the Ministry of Economic Affairs and Communications as the representative of the state on the other, signed a cooperation agreement **"Computer Protection 2009"** (in Estonian *Arvutikaitse 2009*), which has later been joined by other major e-service providers. The mission is to make Estonia a country with the most secure information society in the world. To this end, joint activities have been launched targeting the users of the Internet and e-services, and promoting massive use of the national ID card and Mobile ID in electronic channels[24].

With the "Computer Protection 2009" project in mind, the Look@World Foundation applied for support from the European Regional Fund to carry out training projects. When planning activities of the six projects for which funding was allocated, it was recognised that more and more public and private sector services are moving to the Internet, and new solutions raising the quality of our life are being constantly developed. Information technology has become an indispensable tool for participation in social life. Yet, in autumn 2008 there were nearly 300,000 people in Estonia, who did not use the Internet and were, thus, cut off from many options it could provide. Survey results show that the reasons for non-use of the Internet usually include lack of skills, motivation and scarcity of financial resources.

The mission of "Computer Protection 2009" is to make Estonia a country with the most secure information society in the world.

In order to lower these barriers, EMT, Elion, Microlink and the Look@World Foundation launched a project "**Come along!**" (in Estonian *Ole kaasas!*). The aim of the project is to provide basic and advanced computer training to 100,000 people and connect 50,000 more families to the Internet over the next three years. To achieve the objective, free training is provided and computers and Internet connections at favourable prices offered.

Training courses of the "Come along!" project

Come along!" is a brand name for training projects on the ID card, Mobile ID and e-services that received funding from the European Regional Fund. In all these projects special attention was given to novice computer users. It was assumed that low motivation to use computer and the Internet might stem from lack of knowledge and that training might contribute to increasing it. To achieve the best results, a common identity was developed for the project and a special website[25], an information system for the management and registration for training courses and a nationwide information service (telephone) were launched. All trainings and counselling are provided for free, held both in Estonian and Russian, and at the end of training courses, electronic certificates are issued for participants. "Come along!" training projects lasted until the end of March 2010 and they were carried jointly with BCS Koolitus AS and IT Protraining OÜ (IT Koolitus OÜ).

Trainings were held in Estonian and Russian on the use of ID card, Mobile ID and e-services.

The **eCitizen's Training Network** project (in Estonian *E-kodaniku koolitusvõrgustik*) entails classroom trainings on computers and the Internet, provided by 260 teachers, who have received special training. Training courses are held all over Estonia both in Estonian and Russian, targeting beginners and advanced users, who would like to learn how to use the ID card, Mobile ID and other e-services. Since May 2009, over 10,000 people have received training on e-services, ID card and Mobile ID. In addition, basic computer and Internet training has been given to more than 9,000 people. In 2010, another 10,000 people will be trained.

In order to take comprehensive training courses to areas, where classroom trainings do not reach for practical reasons, an **eBus project** was initiated. The Bus training courses took place on a special "classroom on wheels" built in a bus. The courses focused on the use

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24   For more information about the project see "IT in Public Administration of Estonia 2008":
http://www.riso.ee/en/files/Yearbook2008/html/Yearbook.html

25   http://www.olekaasas.ee/ (in Estonian only)

The eBus project brought computer training also to the smallest places.

of ID card, Mobile ID and e-services. In addition, it was possible to obtain, free of charge, new PIN codes for the ID card or buy the ID card reader. The eBus toured smaller places and skirts of Estonia from July until September. During that time nearly 195 trainings for approximately 1,200 people were organised.

Mobile training box distributes information on e-services, the ID card and Mobile ID in busy places. The training box, consisting of a rear wall that invites to the training, two teachers, a study place and a computer, stops at shopping centres, libraries, fairs and popular events to offer ID training. Practical personal training in the training box takes 10-15 minutes. For those interested in further training, teachers suggest relevant classroom trainings; in addition, taking online training course is recommended for the knowledge to really take root. Since June 2009, over 14,000 people from all over Estonia have received training in five mobile training boxes and nearly 20,000 more people got assistance and information from the boxes.

eServices' consultation centres offer customers personal advice on the use of e-services. At the same time, people can receive practical training in the use of the ID card or Mobile ID or obtain information on classroom trainings. There are ten consultation centres all over Estonia operating in the service centres of organisations and enterprises that provide e-services. Counselling is based on e-services of a particular organisation or enterprise, but advice is given also for the take-up of other e-services. In addition, feedback is requested through a questionnaire regarding the use of e-

services. From the end of October till the end of 2009, nearly 5,500 people were consulted and approximately 3,000 of them also took the ID card or Mobile ID training. In addition, over 3,000 people received assistance and information.

Interactive online training course on e-services allows anyone to complete ID card, Mobile ID and e-services' training independently over the Internet. The training material was completed in autumn 2009 and is available in Estonian and Russian[26].

To conclude, the "Come along!" training courses rendered advice and assistance in 2009 to over 65,000 people, of whom about 38,000 also passed the training.

Another initiative of the Look@World Foundation, the **ID support centre**, was launched at the end of January 2009. The project is funded from the European Regional Fun and is implemented jointly with AS Sertifitseerimiskeskus. The project encompasses the following channels: ID

A community of volunteers to organise additional computer training and to provide user support.

website[27], ID support centre's website[28], ID Help Line 1777, and e-mail abi@id.ee. These channels assist people in the take-up of the ID card and Mobile ID, and also assist with problems related to using the ID card or Mo-

26   http://www.olekaasas.ee/veebikoolitus (in Estonian only)

27   http://www.id.ee/
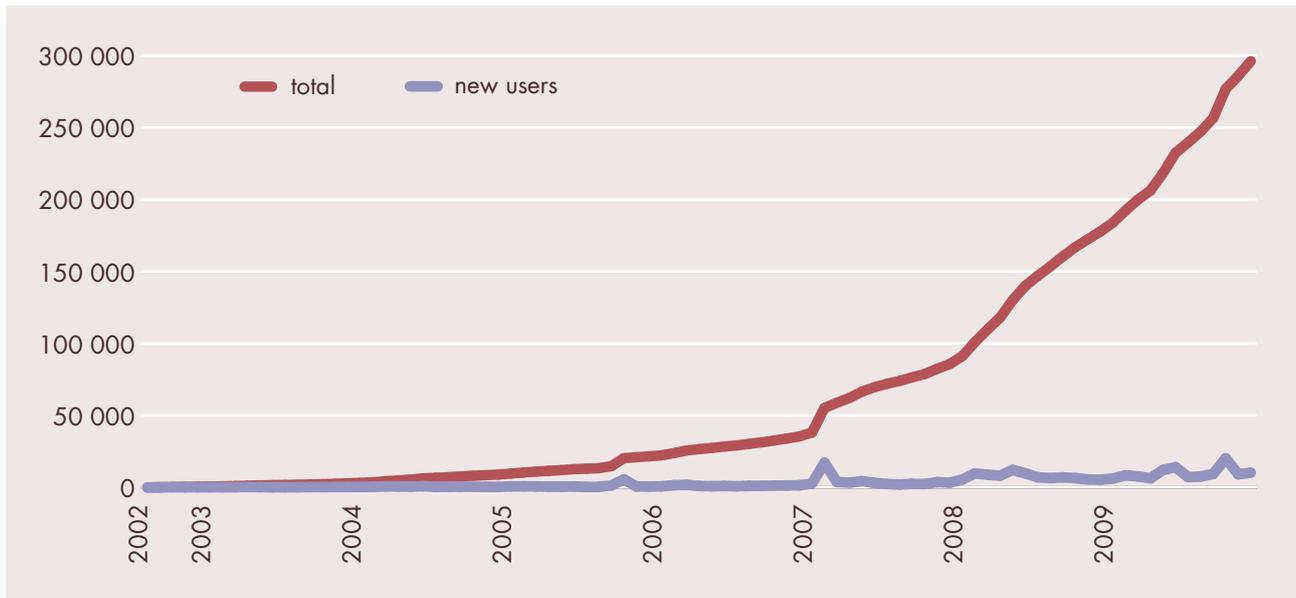
28   http://support.sk.ee/

FIGURE 1. Online ID card users in 2002–2009

bile ID. In 2009, nearly 25,000 customer calls and more than 2,000 e-mails were answered. The ID website received more than 2.3 million and the website of the ID support centre over one million hits.

In addition to the above-mentioned counselling and end-user training funded from the European Regional Fund, a **mentoring programme for the "Come along!"** was launched in 2009. The project aims to develop a community of volunteers, who would organise additional and longer computer training and provide user support in their community. Training days were organised for nearly 70 mentors in Tallinn and Harju County. Participants received an overview of the "Come along!" project, other cooperation projects and the mentoring programme for volunteers, the tools and materials of which mentors could use in their work. With the assistance of adult educators of the Tallinn University the specifics of adult training were briefly covered. Group work concentrated on discussing the essence of voluntary mentoring and its challenges and opportunities.

Trainees willing to disclose their data became "official mentors" and their data can be found on the "Come along!" website[29]. Those having passed the "Come along!" training can then contact a mentor, who will provide them further guidance and teaching. Likewise, the mentors themselves may, at their own initiative, form training groups and provide training. Several mentors have already done that.

Computers and Internet connections

EMT and Elion offer those having passed the "Come along!" training affordable Internet connection and desktop or laptop computers, both used and new ones. Surveys show that the economic barrier is often of emo-

tional nature, meaning that people do not frequently know the actual cost of computers and the Internet, while the prices are usually lower than they think. Therefore, computer and Internet connection offers are introduced already during training. Those who have completed the training can then ask for assistance from teachers and mentors in obtaining a computer and the Internet.

Since there is a number of families in Estonia, whose economic situation does not allow them to purchase a computer, a sub-project of "Come along!" was initiated with partners in spring 2009 for the distribution of free computers. During this non-profit project, more than 250 used computers were collected from enterprises, and fixed and distributed to those in need, the retired, large families and the disabled, through different organisations and unions. Over 60 volunteers from 15 organisations and enterprises participated in these working bees.

Number of ID card and Mobile ID users

The "Come along!" project has actively collaborated with the partner network of the "Computer protection 2009" initiative and has contributed to its objectives. In 2009, altogether 118,363 people using the ID card in its electronic functions were added and at the beginning of 2010, 27% of all the ID card owners also used it. The number of new users peaked in October, when 19,350 people used their ID card electronically for the first time for iVoting at local government elections. At the end of 2009, a total of 296,154 people had used the electronic functions of their ID card.

The ID card is used for electronic authentication at more than 70,000 times and for digital signing at 40,000 times per day. The Mobile ID is also gaining ground. At the end of 2009, over 17,000 people possessed the Mo-

29   http://www.olekaasas.ee (in Estonian only)

bile ID with valid certificates. In addition to EMT, telecom operators Elisa and since 2010 also Tele2 offer Mobile ID to their customers.

Conclusion

The experience of the Look@World Foundation shows that training intended to promote the use of computers, the Internet and e-services must be extremely practical. Feedback from training participants indicates that current non-users of the Internet are afraid of IT – both the computers and the Internet. Thus, on one hand, the training needs to demonstrate the advantages of using the Internet and e-services while being hands-on and, on the other hand, it needs to inform learners of online risks and teach safe Internet use.

Many people used the opportunity to participate in different "Come along!" trainings by coming to the mobile training box or eServices' consultation centre for advice or instructions, by participating in a classroom or eBus training and later polishing their ID card and Mobile ID skills through online training. The "Come along!" training courses assisted over 65,000 people of whom about 38,000 also received practical training.

The number of ID card users has surged in recent years, amounting to nearly 300,000. Mobile ID is gaining ground, and secure authentication and digital signing are a part of the basic skills of Estonian computer user.

To conclude, it can be said that people take keen interest in e-services, the ID card and Mobile ID. For those with little experience with the Internet the process of learning takes a while. Therefore, it is vital to continue computer and Internet training for the residents of Estonia.

1.2.3.
COOPERATION FOR THE PROMOTION OF SAFER INTERNET USE BY CHILDREN

MALLE HALLIMÄE
malle@lastekaitseliit.ee

KERLI KUUSK
kerli@lastekaitseliit.ee
Estonian Union for Child Welfare

In January 2009 the Ministry of Social Affairs set up a working group of representatives from the public, private and the third sectors to promote cooperation between agencies dealing with Internet safety for children and to make preparations for Estonia's accession to the European Commission's Safer Internet Programme.

Members of the working group on Internet safety for children:
- Ministry of Social Affairs
- Ministry of Education and Research
- Ministry of Internal Affairs
- Ministry of Justice
- Ministry of Economic Affairs and Communications
- Ministry of Culture
- Tiger Leap Foundation
- Look@World Foundation
- Estonian Informatics Centre
- Microsoft Estonia OÜ
- Police and Border Guard of Estonia
- AS Sertifitseerimiskeskus (Certification Centre)
- Tartu Child Support Centre
- Estonian Union for Child Welfare
- Unicef Estonia
- University of Tartu

Based on international comparative data, Estonia ranks among the top of European countries in terms of children's Internet use. According to Eurobarometer 2009, 93% of Estonia's children and young people under 18 years of age use the Internet, which puts Estonia

on the second and third place together with the Netherlands and Denmark among the EU countries.

Unfortunately, Estonian children also top the ranking with respect to experiencing online risks. 31% of Estonian children aged from 6 to14 have experienced bullying, name-calling and harassment on the Internet (Europe's average is 15–20%); 19% of them have felt disturbed by something when communicating with strangers in a chatroom or instant messaging programme; 13% of children aged from 11 to 14 have got together with strangers they have met in a chatroom or instant messaging programme (Europe's average is 9%); 58% of Internet users under 18 years of age have encountered potentially harmful content on the Internet (Europe's average is 31%) (Haselbrink et al.). Surveys carried out by various organisations (Turu-uuringute AS, Estonian Union for Child Welfare, University of Tartu) in recent years have shown that children and the young are generally aware of online risks; however, they are willing to take risks, including meeting strangers they have met online in real life.

Estonian children top the ranking with respect to experiencing online risks.

Low parental interference with children's Internet use is also characteristic of Estonia. According to the Eurobarometer 2009, less than half of Estonian parents worry that their child might see inappropriate material on the Internet. Approximately one third are concerned that their child might become a victim of bullying. Estonian parents also take low interest in what their children do online, being next to last after the Czech Republic in the ranking.

On 10 February 2009, the Safer Internet Day was organised for the first time by the working group on Internet safety for children. The Safer Internet Day is an initiative of the EU Safer Internet Programme, which aims to promote safer use of communications technologies and the Internet. Since children and the young are often the first to adopt new media technologies and as they represent the largest age group among Internet users, the programme primarily focuses on improving the skills of safer Internet use among children.

The Safer Internet Day aims to promote safer use of the Internet.

Though Estonia has not yet joined the Safer Internet Programme, different institutions have organised events to celebrate the day independently also in earlier years. In 2009, the member organisations of the working group joined efforts in organising the Safer Internet Day. The main focus of events was on raising parents' awareness of online risks for children. The main message for parents was to take interest in what their children do on the Internet. A press conference was held, opened by the First Lady of Estonia Evelin Ilves. Later, parents could participate in an open lecture, where they received knowledge and practical instructions on how to make their child's Internet use safer. On the same day, awards were granted to the best works submitted to a competition "Traps in the Internet", organised by the Tiger Leap Foundation. Children could submit creative works featuring online risks and how to deal with them. The competition was very popular and children made a total of 112 short films, comic strips and presentations.

In addition, the Safer Internet Day served as a kick-off for the launch of a media campaign "You would protect your child in real life. Do it online, too!" organised within the EU Structural Funds' programme "Increasing awareness of the Information Society". In the campaign, a video clip calling upon parents to take interest in their children's cyber activities was shown on TV channels and Internet portals.

In spring 2009, a new website was developed by the working group. The site[30] contains links to other websites providing information, both for children and parents, on online risks and offering guidance on increasing the safety of Internet use.

The working group's further work mainly focused on making preparations for accession to the EU Safer Internet Programme, which has the following objectives in 2009–2013: promoting safer use of the Internet and other communications technologies; educating users, especially children, parents, caretakers, teachers, and education workers, in the field; and fighting against illegal online content and harmful behaviour on the Internet.

To join the Safer Internet Programme, a project "Raising awareness of safer Internet use in Estonia" was designed at the initiative of the Estonian Union for Child Welfare. The project, submitted to the European Commission in November 2009, was developed in cooperation with the Union for Child Welfare, the Ministry of Social Affairs, the Tiger Leap Foundation, and the Police and Border Guard Board. In case funding for the project is allocated, a safer Internet use centre will be established in Estonia for raising awareness, organising campaigns and training courses, and compiling information materials. In addition, a web-based hotline will be developed for notifying of illegal online content. The project will also support the functioning of a helpline providing guidance, by phone and over the web, on resolving problems related to the use of mobile phones and the Interenet. Furthermore, an Advisory Chamber of representatives from ministries, the private sector and non-governmental organistions, and a Youth Panel, consisting of representatives of youth organisations, will be established.

Work will continue also in 2010, including preparations for celebrating the Safer Internet Day on 9 February.

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30 http://lapsnetis.eesti.ee/ (in Estonian only)

1.2.4.
DO WE GO TO WORK OR DO THE WORK? THE ESTONIAN TELEWORK ASSOCIATION IN 2009

KRISTINA TÄHT
kristina@telework.ee
Estonian Telework Association

In old times people used to go to work, whereas now work has come to people. For some it takes two hours to go to work every morning, whereas for others the working day starts at home in front of a PC. This makes working more comfortable and also establishes new ways of living, for instance in suburbia. Working away from employer's premises is called telework, although such way of working actually brings work closer to people.

The Estonian Telework Association and telecentres

The Estonian Telework Association was founded in 2007 to gather information on telework and to offer support services for telework. The Association aims to introduce the opportunities of telecommuting to employers, employees and local governments. In the future, it will also hold consultations to employers and employees on how to implement teleworking. The Association has identified best practices and failures, and also telework related research both in Estonia and abroad. In addition, the Association works in partnership with telework organisations in other countries and contributes to developing an international telework network. The Estonian Telework Association has established contacts with a number of countries in the European Union and outside. It also assists local governments and entrepreneurs in founding telecentres.

Introducing the opportunities of telecommuting to employers, employees and local governments.

Telecentres are public premises for working nearby residential areas to allow people work close to home and save time spent on driving to and from work. This allows to better balance work and personal life in a pleasing environment. Telecentres may be private profit-oriented organisations, non-profit associations, local governments or state centres, or networks with all these parties. They may be located at an institution, such as a library, a university, a Public Internet Access Point, etc.

There is a network of telecentres in Estonia that promotes computer work regardless of the location of the owner of the PC. The first ones to join the network were the telecentre of Paide, which was founded as a call centre jointly by the Estonian Telework Association and the City Council of Paide, and the telecentre of Laulasmaa, which also includes a day care for children. Telecentres will also be opened in Abja, Kuusalu and Kanepi with the help of the local governments there. The first telecentre in Estonia was established on the island of Hiiumaa several years ago. It is currently operating as a call centre, giving the locals the opportunity to work there without leaving their home island.

Awareness raising and training

In 2008-2009 the Estonian Telework Association participated in a project of the Estonian Employers' Confederation, which aimed to enhance management efficiency in private and public sector organisations and local governments through increasing the flexibility of the organisation of work. The goal of the project was to increase awareness of telework and give practical know-how in that area. The other partners of the project

Telework inspiration days introduced the specifics and management of telework.

were MTÜ Arhipelaag, the Estonian Regional and Local Development Agency, the Look@World Foundation and the Labour Market Board. The project was financed by the European Social Fund.

In October and November 2009 the Estonian Telework Association and its partners organised telework inspiration days to introduce the specifics of telework and management of telework. The inspiration day held in Tallinn, Tartu and Paide revealed mixed opinions among the speakers and participants as regards teleworking. Marika Priske, Chancellor of the Ministry of Economic Affairs and Communications, who represented the public sector, stated that working together with other people in an office environment will not become obsolete. Most people like to discuss work matters with their colleagues and superiors, not just agree on the expected work results. "It is in our nature to be lazy and to as little work as possible," said Mrs Priske. Taavi Kotka, leader of Webmedia, however stated that it is difficult to motivate oneself to work at home while juggling family life. Janika Leoste, manager of a popular children's website lastekas.ee, opposed by claiming that if people are not motivated to work home, even though they have agreed on the expected work results, they can stimulate work even when in front of their superiors. Daniel Vaarik, a communications expert, introduced Second Life, a virtual life environment, where everyone can lead a virtual life, do virtual work and even create a virtual family.

Evidently, most people lie somewhere between the two extremes: zero tolerance *versus* 100% telework.

Seminar participants also voiced that if a company values results, not physical attendance, the keywords appear to be self-motivation and result-orientation, for both employers and employees. The labour market is facing tightening competition, globalisation, growing work intensity and 24/7 services, it is necessary to increase efficiency and flexibility to keep up with competition. Telework often provides more efficient and cost-effective opportunities than the traditional ways of working.

Telework often provides more efficient and cost-effective opportunities to keep up with competition.

Therefore, the Estonian Telework Association has developed a training and consultation programme for organisations willing to introduce telework. A virtual know-how base and guidelines are available at http://wiki.innolabor.net.

Another major project currently underway aims to develop a network of telecentres to help risk groups in entering the labour market and finding employment and to provide better opportunities for individual development.

The project started in 2009 and is scheduled to end in 2011. During this time five pilot telecentres will be founded and preparations will be made for ten more, local trainers will be identified and training for risk groups will be carried out. Experience will be gained from training trips to the telecentres in the Netherlands, Scotland and Spain. The cost of the project is around EEK 9.8 million (EUR 626,000). The project is funded through Innove's open call for proposals under Measure 1.3.2 "Improving the Quality of Working Life", the "Lifelong Learning" priority of the Human Resources Development Plan.

There are different telework arrangements: many work from home or a telecentre, while others are mobile workers who have their work always with them just like snails carry their shells. Apart from having new skills of utilising information and communication technologies, there is also bigger responsibility for work results. Instead of sitting through hours and hours, the new work arrangement involves agreeing upon the results and deadline with the employer. This way the employee can better balance work with family life, friends and hobbies, as human life is a whole of many activities. Office work from nine to five need not be the best way for jobs that require going into depth. Sometimes inspiration strikes while sitting under a tree or in late night hours. The author of the present article works in warmer countries in the wintertime, because work advances better in the sun and also motivation is higher, as sitting in front of a computer alternates with exotic travels. From the employer's standpoint, it would be a waste not to use these fruitful moments and favourable environment, but require working onsite instead. *We do not go to work but do the work* is the principle that the Estonian Telework Association would like to anyone who is able to practice telework. The Association also introduces best practices of telecommuting in Estonian companies and gives practical advice to both employers and

employees on how to make work arrangements more efficient. Flexible work arrangement and telework helps change the lifestyle and working habits of those working with computers by enabling to work at a more convenient time and place.

The history of the term *telework*

The terms of *teleworking* and *telecommuting* were coined and defined by a U.S. scientist Jack Nilles in 1973. Before that, the idea of reversing the concept of classical work and working place was rather exceptional. For Nilles, it seemed odd that while work often means "moving information", the performer of the work should make an extra effort to go some place else to do that move. The father of telework, as the international media has often called Nilles, once said in an interview that *telework* as a term will most probably become obsolete, as the affix *tele* will denote a common way of working in the future.

Today, the main obstacle to implementing telework is no longer technological, but reluctance to abandon traditional work habits. We still prefer old-school work ethic, even though information technology offers a wealth of new opportunities. This is seconded by the "edifice complex", another expression coined by Nilles, which means that we have to have an impressive office building to demonstrate our prestige. If the work we do does not involve eye-to-eye contact with clients or physical attendance for any other reason, then why do we need an expensive downtown office in the first place? Instead, we could hold virtual weekly meetings or reduce the office space and let people do their work at a place of their choice.

The main obstacle to implementing telework is no longer technological, but reluctance to abandon traditional work habits.

Why and how to *telework*?

Telework or telecommuting is a work arrangement in which employees use information and telecommunication technologies away from employer's premises. People often ask how many telework hours a week it requires or what are the working conditions to call one a teleworker. In other words, is the work that is taken home, or overtime, also telework? As employment has become more flexible, the limits between different work formats have become blurred. Terms like *telework*, *telecommuting*, *e-work* and *mobile work* have come to use. Today, one can work at any place with telecommunication devices and an inspiring environment. Telework also allows to prolong vacation at a distant place. Thus, telework is a work format that is dispersed both in time and place.

This brings us to the term *telepresence*, which simultaneously denotes presence as well as absence. Absence in terms of information society means distant presence without physical presence through the use of information and communication technologies.

The benefits of telework for employers:
- increases efficiency – the results of work are measured instead of the time of working, and the contribution of employees is easily seen
- increases workers' satisfaction – according to research, a wider range of choices and control over one's work increases satisfaction with work
- helps motivate good employees and extend the scope of recruitment, i.e. find employees from other regions or countries
- reduces office and transport costs
- helps improve also the work arrangement of office workers through the use of IT

The benefits of telework for employees:
- spares time and the cost of driving to and from work
- increases satisfaction with work
- increases one's own judgment of one's work
- improves the quality of life by reducing stress and leaving more time for personal life

The benefits of telework for a community:
- facilitates more effective use of human resources
- reduces traffic jams and transport-related environmental problems
- reduces air pollution
- reduces energy consumption
- leaves time for voluntary work
- reduces parking problems in cities

Does more presence contribute to better communication?

The "electrical speech machine" invented by Bell in 1876 has developed from a distant speaking device into a videophone. It is up to each individual to decide whether videophone meetings and speeches still lack something and whether physical attendance gives additional value to a business meeting. Either way, a conference call instead of driving to a meeting to another city or country is worth trying, as it does not entail any additional costs.

Traditionally, it is thought that eye-to-eye communication is better than a phone conversation, as around 80% of the communicated message is non-verbal, while a phone conversation is better than communication by e-mail, because intonation gives additional information to a text and avoids potential misunderstandings. There appears to be a wide gap between generations: the older generation prefers phone and eye-to-eye communication, while the younger computer generation favours web conversations. The computer generation feels comfortable with using Skype and MSN. The benefit of electronic communication is that it is better considered and

Photo: Heiki Laan

takes place at a time of one's own choosing, whereas a phone call might come at an inconvenient time or place that hinders effective communication. It is important to find the most suitable solution for both parties.

Communication expert Daniel Vaarik revealed a surprising fact at an inspiration conference: eye-to-eye communication may involve as much "noise" as phone conversation, whereas phone communication may include less noise than e-mails. He explained that the quality of communication may be higher because e-mails can be replied after deliberation and at a convenient time. Some people produce a lot of information noise when they enter a room, while being effective and to the point in their written messages.

How wide-spread is telework in Estonia?

Although the penetration of information and communication technologies allows for much more flexibility in work, office work on employer's premises five days a week still prevails in Estonian companies. A survey carried out in 2007 by the Pärnu College of the University of Tartu revealed that 76% of the 3,156 employees of the 323 companies that participated in the survey worked only at an office, while 23% worked also elsewhere, primarily at home.

38% out of 231 respondents said that they teleworked because they could not complete work at the office; 33% considered working at home more convenient than going to the office; 25% said they could better concentrate at home; and 4% wished to save on transport costs.

A systematic introduction of telework also requires substantial changes in work arrangement. More specifically, the *results* of work are measured instead of the *time* of working. However, so far 93% of the employees in Estonia receive remuneration on the basis of the working time and 4% on the basis of piece work (e.g. the number of pages translated); only 5% of the employees are paid on the basis of a combination of time and results.

Telework equipment and safety

In addition to other working conditions, it is necessary to agree on the safety requirements for working away from the office. For instance, the risk of an information leak can be minimised by keeping the data needed for work in the central server of an organisation, not in an employee's PC, and by establishing an ID card login system to access these data. Many companies have defined mandatory safety precautions in the employment contracts to protect against risks to safety, and failure to comply with the precautions is punishable.

As a rule, it is the responsibility of an employer to provide all the information and communication tools and solutions that a teleworker needs. This includes:

- an Internet connection with sufficient download and data transmission speed
- hardware: a working computer, printer, scanner, and web cam (compatibility with the computer)
- software (Microsoft Office and other specific programmes)
- a firewall, antivirus software and data protection equipment (e.g. login using an ID card or fingerprints)

Conclusion

Although in the 21st century hour-to-hour factory work is being replaced by computer work, our working habits still date back to the industrial times. If we work with our heads and computers, we might well do it somewhere comfortable and at the most productive time, at late hours and in a warmer climate during wintertime. Everything is possible with the Internet, as the option of teleworking actually brings work closer to people.

1.3. Broadening technological access to digital information

1.3.1.
ESTWIN – THE NEXT-GENERATION BROADBAND NETWORKS

OLAV HARJO
olav.harjo@elasa.ee
Estonian Broadband
Development Foundation

The year 2009 saw an important event in the Estonian ICT field, the launch of EstWin, the largest joint public-private sector project of all times. EstWin aims to take the Internet and data communication networks to a whole new level – the next-generation broadband networks.

The need for new telecommunication networks

The European Commission has stressed the need to build the next generation of Internet and broadband data communication networks already for some time. The reason lies in rapid growth in information traffic through networks, which means that in the near future the current networks will no longer manage the transmission of data.

New IT solutions are increasingly being introduced in all areas of life, be it eGovernment, education, medicine, business, entertainment or human relations, which is why there is a growing need for more network resources.

At the end of 2008, the Ministry of Economic Affairs and Communications (MKM) asked the Estonian Association of Information Technology and Communications (ITL) to propose a plan for developing the next-generation broadband networks and for identifying how the state can help the business sector with that.

The reason for such a request was that in many advanced countries old networks are being replaced by next-generation fibre-optic networks on the initiative of the public sector. A number of countries use public sector resources for that purpose, as they understand that state-of-the-art means of communication are vital for the whole society.

Different authorities of the European Union are of the opinion that the development of the next-generation broadband networks is relevant for the competitiveness of the entire EU. Viviane Reding, European Commissioner for the Information Society and Media, has called upon all EU Member States to develop new national broadband strategies in order to ensure the availability of next-generation information society services for all EU citizens and companies.

Several advanced countries have already started with the development of new networks. For instance, Australia plans to invest AUD 43 billion; Singapore expects to connect 95% of the buildings with new networks by 2012; Finland expects to establish a 100 Mbps connection by 2015; Lithuania intends to build RAIN 2 fibre-optic connections in all rural regions, etc.

The start of a partnership between the state and telecommunications companies

Upon MKM's request, ITL set up a working group, who had to prepare a development plan for the next-generation broadband networks in Estonia in partnership with the public sector by April 2009. The working group contained representatives from major telecommunications companies in Estonia – Elisa Eesti AS, Elion Ettevõtted AS, Starman AS, Santa Monica Networks AS, Televõrgu AS, Levira AS – and also from the Ministry. The working group produced *The Development Vision of Next-generation Broadband Network in Estonia* and concrete proposals for implementing the vision. In addition, with the help of Ericsson Eesti AS all the next-generation optical networks in Estonia were mapped and a network solution for covering rural Estonia was proposed. Ultimately, the working group also set a specific goal to make the next-generation broadband connection of 100 Mbps available for everyone by 2015. The project was called EstWin.

In April 2009, the ITL working group introduced its results to Juhan Parts, Minister of Economic Affairs and Communications, who was pleased with the group's work and promised to seek funding for the project from the EU support funds in the amount of 1.5 billion

The next-generation broadband connection of 100 Mbps must be available for everyone by 2015.

kroons. In June, the project was presented to the Estonian Government, who also highly approved of the project and started to support its implementation.

The state and private sector representatives agreed that the former would help with developing the next-generation broadband networks in the rural regions, where the latter may face difficulties in the context of the current market situation. The companies will be responsible for establishing new networks and for offering new services in urban regions, while using the networks built under the EstWin project to provide services also in rural regions.

Negotiations between telecommunication companies over who and how is to found an organisation for the implementation of EstWin lasted throughout the summer of 2009. Consequently, it was decided to set up a joint foundation of Levira, Elion, Elisa, Tele2, EMT, Eltel and Ericsson. The ceremonial inauguration of the foundation took place on 11 August 2009 in the Ministry of Economic Affairs and Communications. The Foundation was called the Estonian Broadband Development Foundation.

The goal of EstWin

The goal of the project is to establish very high-speed next-generation broadband connections in the rural regions of Estonia in order to bridge the digital gap between urban and rural communities and to ensure long-term development in these regions. The EstWin project and the Foundation aim to cover rural Estonia with a network of fibre-optic cables, so that 98% of all the residential buildings, companies and agencies be located maximum 1.5 kilometres from the network. To achieve this, over 6,000 kilometres of fibre-optic cables and over 1,400 network interfaces must be built.

Project implementation

The responsibility for project implementation lies with the Estonian Broadband Development Foundation, who cooperates with all stakeholders to ensure the balanced integration of everyone's interests in the EstWin project. First, the location of social infrastructures, businesses and residents will be mapped jointly with the Ministry of Internal Affairs, the country governments and the local governments. Then the most optimum network solution will be identified together with the operators, while making use of the existing communication facilities of the operators, if possible. Project funding from the EU support funds will be raised by the Ministry of Economic Affairs and Communications, the Ministry of Agriculture, the Ministry of Internal Affairs, and the Ministry of Finance. Other partners include the Road Administration and various infrastructure companies.

This is just the start

Estonia has been among the leading Internet countries for a decade now. The new broadband strategy and the EstWin project contribute to Estonia's further development and help keep up pace with other Internet pioneers. We should bear in mind that the Internet started to gain more ground only fifteen years ago, which means that we are only at the beginning of the road. At this point, it is too early to say where this road leads to and what it will bring about. However, we can be certain that over the next fifteen years the world will change more than we can imagine. So, let us be prepared.
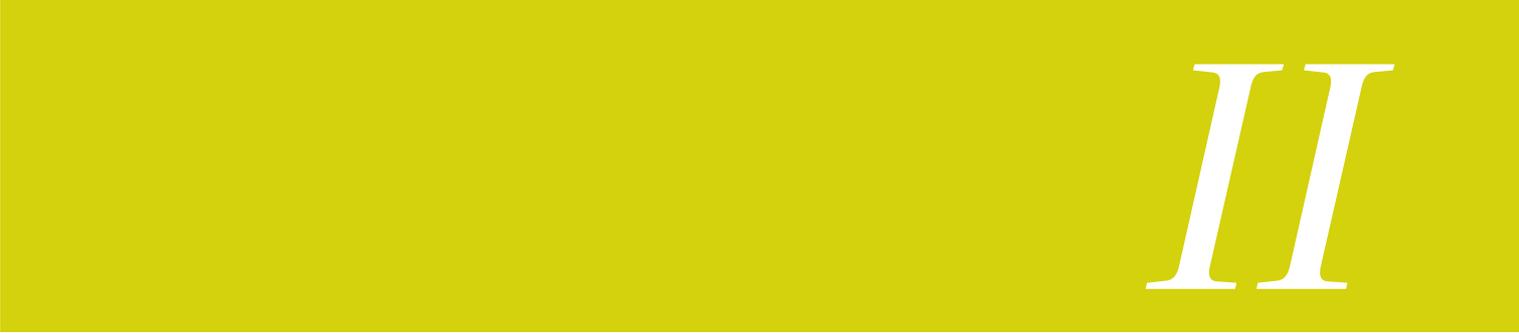
II

Development of a citizen-centred, transparent and efficient public administration

2.1. Improving public sector efficiency

2.1.1.
SUPPORT SERVICES OF STATE AGENCIES TO BE TRANSFERRED TO A COMMON INFORMATION SYSTEM

MAREK HELM
marek.helm@fin.ee
Ministry of Finance

Double work done due to incompatible information systems, repeated manual entry of data and documents printed on paper will soon be bygones in the support services of state agencies. At the start of 2010, the Ministry of Finance initiated a project to join support services. The objective is to transfer state agencies to a common system of financial accounting, personnel records and wage calculation.

The starting line

In 2009, there were 202 accounting entities in Estonia's 242 state agencies. 15 different versions of accounting software with 150 various setup versions were in use. Personnel records were usually agency-centred, which means the general overview of personnel is incomplete. For example, there are 100,000 cases of official travel registered in a year. In some organisations, these are prepared and approved in records management systems, but the data reach economic software so that information is first printed out and then re-entered in the financial accounting information system.

In order to find the best solution to simplify the situation, the Ministry of Finance carried out a detailed analysis in 2009. As a result, it transpired that there are considerably more efficient ways to organise national information systems. This is also confirmed by other countries' practices (e.g. Finland, Great Britain, Northern Ireland). Proceeding from international experience, the project team suggested setting up a separate organisation (service centre). The suggestion found no support after three cabinet meetings.

What is going on

The beginning of 2010 saw the start of joining support services. This means, financial accounting, personnel records and wage calculation systems will be transferred to a common SAP-software. To this end, each ministry and their areas of government will have working groups of financial accounting, personnel records and wage calculation. The working groups will be led by members of the Ministry of Finance's project teams. The objective of the working groups is to work out the best solutions taking into account the specific needs of organisations.

All the 242 state agencies will be transferred to a common information system of financial accounting, personnel records and wage calculation by 2013 at the latest.

What is our goal

The objective of joining information systems is to improve management information, raise effectiveness and receive a better overview of the state's administrative expenditure.

The transfer of information systems to common software ensures that state agencies will have information that can be commonly processed and measured and a full overview of the movement of resources. This will ensure that e-bills, e-documents and web-based accounting systems are processed much faster, making information needed for management available in real time. There will be no double work or manual entry of data, since information will move electronically from one programme to another. The accumulation of competence and training of employees will guarantee a uniformly good quality of services.

The unification of support services will decrease bureaucracy in records management and render a retrenchment of operating expenditure. This will enable the provision of better-quality public services at smaller costs. After four-year development, the cost of support services should decline by 20–30%.

The programme "Optimisation of the organisation of support services in the public sector" has been prepared within the framework of the priority area "Larger management capability" of the measure "Increasing the strategic management capacity of the state, local governments, and non-profit associations".

2.1.2.
UPDATING THE INTEROPERABILITY FRAMEWORK

UUNO VALLNER
uuno.vallner@riso.ee
Ministry of Economic Affairs and Communications

Interoperability refers to the ability of disparate and diverse organisations to interact with each other in order to achieve useful common objectives agreed upon, by sharing information and knowledge via data exchange based on ICT systems.

Interoperability framework is an agreement between organisations and an instrument to achieve interoperability. The framework includes common elements agreed upon: the dictionary, concepts, principles, policy, guidelines, recommendations, and practices.

The Estonian Interoperability Framework was introduced in 2004. The volume and relevance of the framework documents has increased over years. The third version, which is being prepared right now, will be somewhat different from the previous ones. It will be more in line with the terminology and general principles of the European Interoperability Framework and other initiatives. However, the Estonian framework is considerably more explicit.

The European approach views the framework as a four-level pyramid (see Figure 1). The documents of the Estonian framework are divided into three levels:

**Level 1** (strategy and framework)
- interoperability framework
- dictionary

Level 2 (framework, architecture)
- semantic interoperability
- security
- software
- webs
- records management
- open standards
- development process

Level 3 (infrastructure services, such as the X-Road, SEHKE, ID card basic software, EEBone, DVK, RIHA, eGovernment portal eesti.ee, RISAP, eID infrastructure, etc.)

The framework is constantly changing. The interoperability framework booklets are created and developed
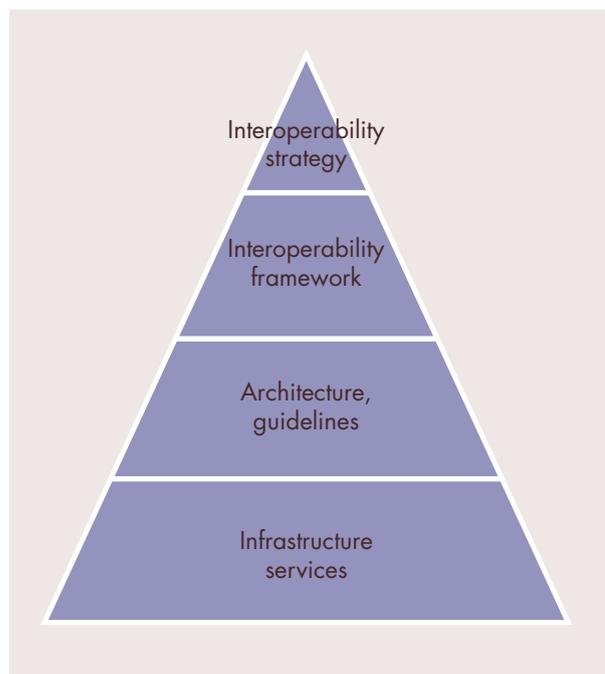
FIGURE 1. Interoperability initiatives

in the Wiki environment.[31] However, the booklets there are not binding on the public sector. When a booklet is ready to be formalised as an official version, it will pass a consultation period in the public sector during which state authorities and local government institutions, the private sector, third-sector institutions and private persons are able to present their opinions and suggestions. The coordination process is analogous to the coordination of legislation. The coordinated version is enacted by the Ministry of Economic Affairs and Communications and published on the website.[32]

The framework documents are mandatory for the entire public sector as an agreement between parties. Pursuant to subsection 33(1) of the Government of Republic Act, subsection 43²(2) of the Public Information Act and the Estonian Information Society Strategy 2013, the Ministry of Economic Affairs and Communications is responsible for the development of the state information system. The framework and related documents are the underlying documents of the state information system. Thus, the framework documents are far more binding on state agencies than the agreement.

Interoperability is viewed at five levels (previous versions did not contain political context):

1. **Political context.** Common visions, priorities, objectives.
2. **Legal interoperability.** General legal approach to services, data, information systems and security.
3. **Organisational interoperability.** The ability of organisations to use information systems to provide services to other organisations or to their clients.

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31   http://www.riso.ee/wiki/ (in Estonian only)

32   http://www.riso.ee/en/information-policy/interoperability

Political context

Legal interoperability

Organisational interoperability

Semantic interoperability

Technical interoperability
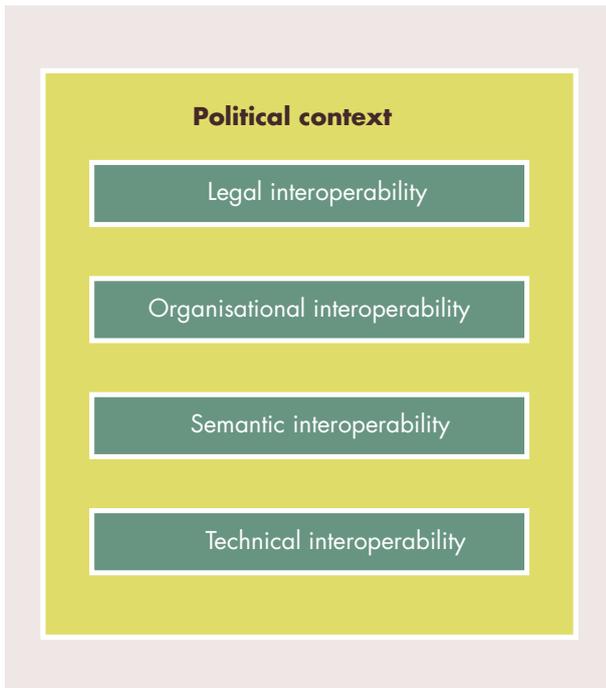
FIGURE 2. Levels of interoperability

4. **Semantic interoperability.** The ability to understand exchanged information (data) in a similar way.
5. **Technical interoperability.** The interoperability of technical and software infrastructure.

The Ministry of Economic Affairs and Communications has established an inter-agency state information technology interoperability working group for coordinating the preparation of the interoperability framework. The working group relies on a network of experts. There are several formal and informal working groups dealing with various sub-topics of the interoperability framework.

Instead of the "nationwide information systems", the new framework adopts a somewhat more general term "infrastructure services", which denotes common technical functionality for the provision of one or more services or of the administration of a database. Typical infrastructure services include the storage of databases in private-sector hosting environments, standard solutions for one-mode information systems (waste handlers' register, pet register, local-government web pages, etc.) and the majority of nationwide information systems. The strength of the Estonian framework lies in effectively-functioning infrastructure services, which ensure that information systems function as an integral whole. The most relevant infrastructure components are:

- **Backbone Network EEBone.** There are more than 20,000 computers connected to the EEBone network. The services of the EEBone are used by more than 850 state and local government institutions or their subordinate units;
- **Public Key Infrastructure (PKI).** More than a million ID cards have been issued in Estonia. Last year these were supplemented by mobile ID. Nearly 30%

of ID card owners use the infrastructure for the purpose of authentication and signing;
- **Secure data exchange layer X-Road.** More than 2,000 institutions have joined the X-Road and there are over 100 service providers offering more than 2,000 personalised services. The X-Road is used 8 million times a year;
- **Information portal eesti.ee.** The objective of the information portal is to offer citizens, enterprisers and officials the possibility of finding reliable information, contact data and public e-services from a single and reliable environment. The portal is visited by about 8,000 people a day. The portal allows citizens and companies to use about 100 personal public e-services and nearly 300 official e-forms. The environment contains over 2,000 articles and more than 1,500 links;
- **Administration System of the State Information System (RIHA).** RIHA includes a services catalogue and a list of information systems with descriptions. In addition, RIHA is an useful tool for coordinators of the state information system, administrators of information systems, service users, Data Protection Inspectorate, and Statistics Estonia;
- **Document Exchange Centre (DEC).** DEC is an information system providing a common central document exchange service for various records management systems as well as other information systems dealing with documents. The objective of DEC is to interface dispersed information systems through the secure data exchange layer X-Road.

In 2010, the main focus of the updated interoperability framework will be on cross-border provision of services, the interoperability of webs and more expansive application of open-source software.

2.1.3.
SOFTWARE FRAMEWORK

UUNO VALLNER
uuno.vallner@riso.ee
Ministry of Economic Affairs
and Communications

Out of the new booklets of the Interoperability Framework, the Software Framework[33] is the most decisive as regards trying to change the existing paradigms. It treats the principles agreed upon in the public sector for the procurement, administration and development of software. The framework distinguishes between proprietary and open-source software. When procuring software, the public sector assesses and chooses software proceeding from neutral principles. In some cases it is better to choose proprietary and in other cases open-source software. The framework attempts to create common mechanisms and methods the public sector can use to assess and select software to be procured. The framework requires that the software developments commissioned by the public sector should be freely used on the basis of the EUPL licence.

The public sector in both Estonia and Europe is using increasingly more open-source software besides proprietary software. According to the Ministerial Declaration on eGovernment approved in Malmö, one of the political priorities presented to public administrations in Europe is paying particular attention to the benefits resulting from the use of open specifications and transferring to the Open Source model. The Open Source model and the use of open-source software is the underlying principle of the European Interoperability Framework.

The framework documents are mandatory for the entire public sector as an agreement between parties.

Open-source software is becoming an integral part of the Estonian IT landscape. But the open-source software development model does not only consist in using open-source software. It is a whole new paradigm that has created differences of opinion, misunderstandings, and, at times, also opposition among the Estonian software users, software producers and retailers.

The open-source software framework considers the following global trends of software production:

- **Increase in the relevance of open-source software.** Studies point to increasing use of open-source soft-

ware. Right now the share is 30% of the entire software market. The use of open-source software in the public sector requires well-defined policies and a supportive infrastructure.

- **Cloud Computing.** In Gartner's opinion, cloud computing is the "killer application" for open-source software.

- **Software as a service.** Both software and hardware are becoming increasingly more part of a service. Service-based approach means that both software and open-source freeware accompany a service for free. Users pay for the service. The business logic of service providers allows using open-source software based embedded components.

- **Joint decisions in Europe.** The draft European Interoperability Framework (Draft EIF v2.0) lists the joint decision of Member States and EU institutions to use open-source freeware as one of the most important principles.

- The open-source freeware framework aims to bring about the following changes in the public sector:

- **Cutting costs.** The use of open-source software may help considerably cut expenditure on the procurement and maintenance of software. A study commissioned by the Ministry of Economic Affairs and Communications showed that the transition of office software to open-source software would save the public sector about 30 million kroons a year.

- **Sustainability.** Information systems will be less dependent on developers and software products. The public sector will be able to continue the development of an earlier information system in cooperation with any IT company.

- **Supporting Estonia's ICT sector.** In the case of open-source software, the Estonian ICT sector will be able to keep the money so far spent on "boxed products". Instead of mechanical sales, high-qualification intensive development work will prevail.

- **Transparency.** Open-source software is, as a rule, based on open standards. Thus, the interoperability of public sector information systems will increase. IT procurements will become more transparent, remarkably decreasing the risk of corruption.

- **Reusability.** The best practice generated in the public sector is reusable and it can be developed further. The impulse created by one procurement is a good platform for new procurements.

- **Harmonisation with European policies.** The use of open-source software is below the European average in Estonia and there is no clear political support to the new paradigm. The framework attempts to change this.

Software openness is an important characteristic, but cost-effectiveness, support of open standards, functionality, avoidance of IPR usage costs and licence restrictions, long life cycle of a solution, and simple adjustability to needs are just as important. The use of

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open-source software is not a goal of its own. State agencies and local government institutions adhere to the following principles in the procurement and ordering of software.

When setting up information systems and preparing calls for tenders, it is obligatory to consider both proprietary solutions and open-source software alternatives. The decision may be in favour of either commercial or free software, or it may combine the two options. However, when all other conditions are equal, open-source software will be preferred. Each decision is made separately.

- In solutions ensuring interaction between information systems, joint projects and multi-used information systems, but also in all new or re-established information systems, only services and products supporting open standards and specifications will be used.
- Dependence on certain-brand-based products and services is avoided in information systems.
- When ordering software for information systems, the code of that software and adjustments to commercial products are also obtained, if possible. The software is registered in the repository osor.eu with the EUPL licence.
- If possible, the software obtained for state agencies and local government institutions follows the principle that the software and its adjustments can be used without restrictions in other public administration institutions as well (the principle cannot be applied in the case of standard software, since its property rights belong to the producer). If several institutions have similar software needs, it might be a good idea to make a joint order.

The framework requires that the open-source software ordered by the Estonian public sector be licensed according to the European Union Public Licence (EUPL).[34] When using software with the EUPL v1.1 licence or distributing own software under the EUPL licence, it is necessary to proceed from "The European Union Public Licence. Guidelines for users and developers".[35]

The framework analyses public sector functions which can be performed on the basis of open-source software. There are currently four areas where the Estonian public sector has to make changes: the operating systems of server computers, the operating systems of workstation computers, database systems, and office software. As regards the rest of the functions, the public sector either has already started using open-source soft-

Office software has generated the most dispute in transition to the open-source software.

ware or there is no direct need for regulation and coordination.

The software framework's standpoints on office software generated the most dispute. Office software is closely tied to document formats. The public sector uses, both internally and when communicating with the general public, document formats that end users can by default read using open-source software. For instance, the formats FDF and ODF are used in both digital interaction between state agencies and communication with the general public (digital signatures, documents and document forms downloaded from the Internet, documents required by legal acts). In the transition period it is allowed to duplicate the contents of documents in some other format that users are familiar with. The documents may be either digitally signed or zipped. The main standards of interaction between information systems and presenting web contents are XML, HTML, PNG and SVG. The listed requirements do no restrict the use of intra-institutional formats.

Most public sector institutions use proprietary systems as office software. According to the analysis commissioned by the Ministry of Economic Affairs and Communications in 2007, 95% of workstation computers in Estonian state agencies use Microsoft Office software. As a result, state agencies spend about 35 million kroons a year on the acquisition of Microsoft Office software licences. On the other hand, there is plenty of free software in the world that support the open document format and other open standards and that are of as good a quality as proprietary software. The Estonian IT companies are ready to offer sufficient technical support for the use of free office software.

The choice of software depends on specific needs.

The open-source office software recommended in the framework include OpenOffice, NeoOffice, KOffice, Google Docs, AbiWord, IBM Lotus Symphony and other tools processing the ODF format by default.

Software produced in Estonia on the basis of the EUPL or some other free software licence can be used without restrictions in any country. The localisation work necessary for the needs of a specific country can be performed by any developer.

The framework establishes that the reuse of proprietary IT solutions procured by the public sector in the public sector, private sector and exports proceeds from the 2004 recommendations of the Estonian Informatics Centre[36]:

The results of development work commissioned by one institution are, if necessary, usable also in other public sector institutions without difficulties and at minimum costs.

34   See http://ec.europa.eu/idabc/en/document/7774

35   http://ec.europa.eu/idabc/servlets/Doc?id=32429

36   http://www.riso.ee/et/?q=node/222 (in Estonian only)

The solutions resulting from development work commissioned by the public sector may be used by the entity that performed the development in business activities outside the public sector.

The public contracting entity does not prevent the use of the solutions resulting from development work commissioned by the public sector in other projects, and if necessary, favours it.

The framework treats also several risks associated with the use of open-source software. Therefore, decisions regarding the choice of software are made according to specific needs. However, the framework does not allow ignoring open-source software as an alternative. Open-source software must be given a chance to compete with proprietary software and open-source software will be applied where it is practical.

Additional information:

Software framework (RISO 2010)
http://www.riso.ee/wiki/Vaba-tarkvara (in Estonian only)

Analysis of the functionality needs of office software used by state agencies (RISO 2007) http://www.riso.ee/et/files/Kontoritarkvara_alternatiivide_analyys_0.pdf (in Estonian only)

Recommendations for using open-source software in state agencies (RISO 2009) http://www.riso.ee/et/files/VabavaraSoovitused_final_v10.odt (in Estonian only)

2.1.4.
NEW VERSION OF THE X-ROAD

AHTO KALJA
ahto.kalja@ria.ee
Estonian Informatics Centre

The following article gives an overview of the new version of the data exchange layer X-Road, Version 5.0, and related regulations. It will also discuss the X-Road in the context of foreign relations and the statistics on use of X-Road services. First, let us briefly recall the history of the X-Road.

The history of the X-Road

The X-Road was first launched at the beginning of 2002 and started to gain popularity since 2003, when the statistics on use reached as many as hundreds of thousands. It may appear that, in technological terms, the X-Road environment has been the same all the time, but actually this is not the case. On the contrary, the X-Road has been constantly improving and only a few code rows have remained since the first version. Let us recall the main versions of the X-Road from recent years.

The initial version of the X-Road, Version 1.0, was completed on 17 December 2001 and supported the XML-RPC protocol. At the same time, it was already clear that a new and more sophisticated data exchange protocol, SOAP, will soon be adopted. So, in 2002 X-Road Version 2.0 was launched, which supported the SOAP protocol. In parallel, the XML-RPC was used. Several following X-Road versions were also developed to consider technological needs. X-Road Version 3.0 contained various new solutions, such as support to asynchronous inquiries and data exchange operations, and possibilities to use MS Active Director to manage user rights. X-Road Version 4.0 have been used since the beginning of 2006. Compared to its predecessor, it includes a number of new functions that allow for the use of highly confidential data by agencies with special rights. New developments will be implemented also in the latest version, Version 5.0.

The functionality of X-Road Version 5.0

The modernisation and development of a new version of the X-Road in 2010 is based on the following objectives:

1. The current XML-RPC data exchange protocol, which has become obsolete, will be fully abandoned. XML-RPC–>SOAP and SOAP–>XML-RPC as potential

1. Population Register. 16%
2. Commercial Register. 13%
3. Schengen IS. 12%
4. Traffic Register 8%
5. Traffic Insurance Foundation 6%
6. Document Repository 5%
7. Police IS. 3%
8. Health Insurance Fund 3%
9. Police Procedures IS 2%
10. Register of Prisoners 2%
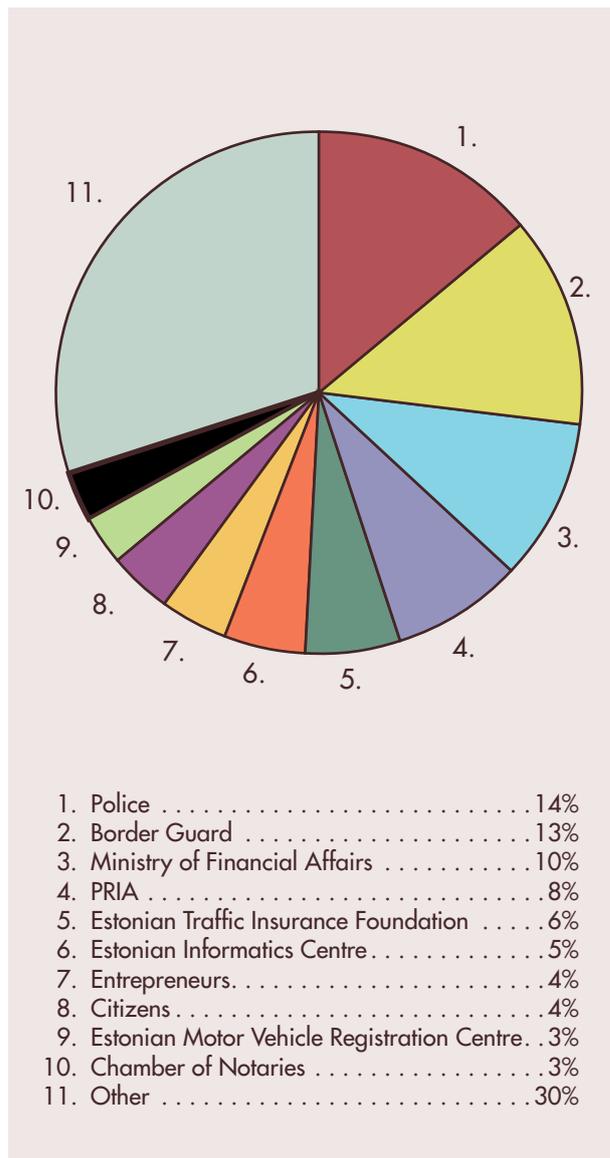11. Other 30%
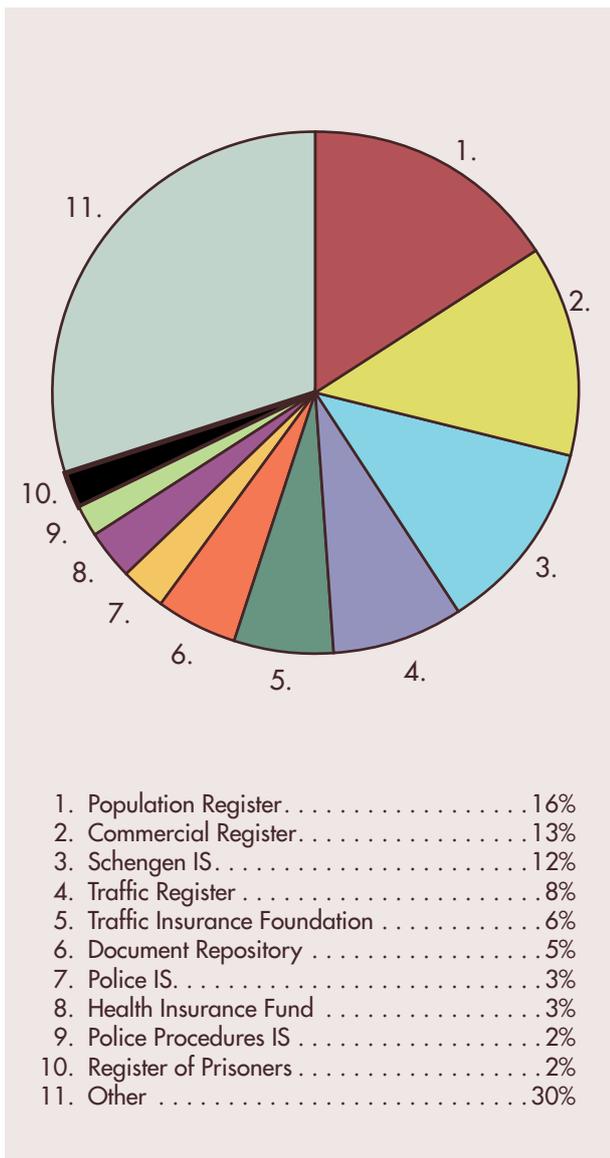
FIGURE 1. Breakdown of X-Road service providers (databases)

1. Police 14%
2. Border Guard .13%
3. Ministry of Financial Affairs 10%
4. PRIA 8%
5. Estonian Traffic Insurance Foundation 6%
6. Estonian Informatics Centre 5%
7. Entrepreneurs. .4%
8. Citizens 4%
9. Estonian Motor Vehicle Registration Centre. .3%
10. Chamber of Notaries 3%
11. Other 30%

FIGURE 2. Information systems using X-Road services

sources of errors will disappear. As the SOAP proto-col was added to the X-Road in 2002-2003, the size and complicity of the entire security server should be reduced.

2. The security of the entire system will be increased by replacing obsolete hash functions with new and more secure ones.

3. System availability and monitorability will be increased, because the number of services grows considerably every year.

4. A new style *document/literal wrapped* will be adopted in the Web Service Description Language (WSDL).

5. Owing to the introduction of a new WSDL style, a MISP portal will be established that will comply with X-Road Version 5.0.

6. A service for encrypting personal data will be developed.

7. A number of minor components will be improved and supplemented.

X-Road and other components of the state information system

The X-Road is a data exchange layer between the providers and users of data services. This allows a single sender, for example the population register, to send data to many users in a simple, flexible and secure way. At the same time, a single user, such as a work station at ePolice, can use the data of many different databases. There are also special partners that are very closely connected to the infrastructure and user logic of the X-Road. Let us give some examples. Together with the X-Road also the Mini Info System Portal (MISP) was established. It is the primary portal for many information systems, for exam-

The X-Road is a data exchange layer between the providers and users of data services.

ple in the social area. The State Portal eesti.ee, the largest state information system, used MISP for a long time (now the provision of services has been integrated into the State Portal itself). At the same time, the e-services component of the State Portal relies on the use of secure X-Road data services. Another major partner of the X-Road environment is the administration system of the state information system (RIHA). RIHA serves as a place for connecting to the X-Road, it includes the data structure descriptions of most of the information systems that have joined the X-Road, and it is used by X-Road administrators. Last but not least, the Estonian Public Key Infrastructure should be mentioned, which plays a significant role in the X-Road infrastructure.

Cooperation with other countries

On the one hand, the X-Road is a secure data exchange layer (software and hardware), whereas on the other hand it is a large organisational structure that involves many human resources (administrators, officials, entrepreneurs and citizens). There is also relatively much legislation in Estonia that is related to the X-Road, such as the Public Information Act, the Personal Data Protection Act, and a regulation on the data exchange layer of information systems (in Estonian only) to name a few.

Many countries have decided to adopt the X-Road application after witnessing its effectiveness.

Many countries have decided to adopt the X-Road application after having seen its effectiveness. For instance, President of the Estonian Republic, Mr Toomas Hendrik Ilves, gave a CD of the X-Road to the Serbian government when visiting Serbia. Other countries that have expressed serious interest in that application include Azerbaijan, Albania, Macedonia, Kazakhstan, Japan, Qatar, Iraq, and Kurdistan to name a few.

Latest statistics

Figure 1 depicts the service providers of the X-Road. The largest providers are major registers like the population register, the commercial register, the traffic register, etc. When Estonia joined the Schengen Area, the number of services of the Schengen information system was expected to fall, but this has not been the case. The year 2010 will probably witness a rise in the use and provision of e-services, given that several major projects have been recently launched in that area, for example the service of digital prescriptions.

The biggest user of X-Road services is now the Police Board, who in 2009 exceeded the Border Guard Administration, the former largest user (see Figure 2). After the merger of several boards, the new Police and Border Guard Board it is likely to remain the biggest user of X-Road services also in the future.

X-Road Version 5.0

The implementation of X-Road Version 5.0 will start at the end of the year after the adoption of software and documentation and the configuration of central servers in the production environment. As the protocols have changed, the use of services in the coming periods will also change. As already noted, the data exchange protocol XML-RPC is no longer supported and it is no longer possible to offer or use services under that protocol.

As far as is known to the Estonian Informatics Centre, such services are no longer in use, although there may be a few exceptions. For example, some PC users still also use MS DOS. At first, both WSDL styles of service descriptions, *RPC/encoded* and *document/literal wrapped*, will be used in parallel. In 2011, the X-Road centre will announce the date from which the obsolete *RPC/encoded* will no longer be supported.

Conclusion

In 2011, the X-Road will be ten years old. Over these ten years, the technology that serves as the functional basis of the X-Road has undergone significant changes and a number of new base versions have been developed over the years. The latest version, Version 5.0, will be completed by the end of 2010. The number of new service providers and users is constantly growing. Statistics shows that the number of uses has followed a steady upward trend throughout the history of the X-Road environment, totalling almost 100 million in 2009. The 100 million milestone is expected to reach in 2010 as a result of the growing number of eHealth services. In 2008, that figure stood at 73 million. The popularity of the X-Road has also caught the attention of other countries, who often visit Tallinn to learn more about this application to adopt it themselves, and there is always the option to outsource the X-Road from Estonia.

2.1.5.
THE DIGITAL SEAL: INCREASING THE SECURITY OF ELECTRONIC RECORDS MANAGEMENT

TAAVI VALDO
taavi.valdlo@riso.ee
Ministry of Economic Affairs and Communications

The term seal *denotes a device for sealing as well as the mark left by sealing. A digital seal is an electronic mark in the virtual word that replaces the permanent physical stamp of relief printing used in the real world.*

The digital seal was regularised in Estonia by the entry into force of the amended Digital Signatures Act on 12 January 2008. This supports the existing best practice and creates prerequisites for developing and introducing new technologies. A digital seal is like an electronic equivalent to an agency's seal or a blank document. It is meant for use by legal persons, but physical persons, in particular self-employed persons, can also acquire one. The public key technology, file format and application environment of digital seals are similar to those of digital signatures. As is the case with digital signatures, the validity of digital seals can be verified by the OSCP (Offensive Security Certified Professional) service. Digital seal certificates are issued by AS Sertifitseerimiskeskus, the cost of an annual certificate is currently EEK 5,000.

A digital seal is a body of data created by a system of technical and organisational means which the holder of the digital seal certificate uses to certify the integrity of a document and to link the holder of the certificate to such document. A digital seal does not carry a representational meaning, but serves as a supplementary security element in electronic records management. A digital seal enables unique identification of the holder of the certificate in whose name the signature is given; enables determination of the time at which the digital seal is given; and links the digital seal to the data in the document in such a manner that any subsequent change of the data or the meaning thereof is detectable.

A digital seal is created by a safe signature creating device, such as an ID card with a security chip, a secure

> *A digital seal is like an electronic equivalent to an agency's seal.*

hardware module, or a hardware module in a server. The Digital Signatures Act covers the digital signature certificate in the context of the digital seal, but along with a digital seal on a chip card that is issued to a legal person it is also possible to get an authentication certificate for the authentication of an agency and for encrypting transactions.

The main purposes of use

1. The need for digital sealing arises from the mass signing of documents. In order to spare time, it is possible to develop convenient automated processes. The technology of digital seals allows to create an independent file from data generated by an information system or from documents issued on behalf of a company. So, it is possible to automatically generate various certifications or extracts that the user can save and later use to certify the integrity and authenticity of data, and the meaning and context of documents. Digitally sealed documents can be classified as follows:

- Administrative documents that are related to the electronic records management of an agency. The seal has been integrated in the records management procedure, and the rights and responsibilities have been assigned.
- Mass data transfers that are related to primary processes, electronic proceeding and machine processing. The rules are included in user manuals and IT profiles.

It is also possible to create digital seals for structural units or for positions to improve work organisation in a company or agency.

2. Additional digital sealing of documents that have been digitally signed by an agency employee to include extra assurance by the agency and to verify the employee's authority to sign. In other words, sealing a digitally signed document gives assurance that the signatory is who he or she claims to be; that is, a person related to the relevant legal person. Therefore, a digital seal helps make electronic records management more secure and reliable.

Rules for the use of digital seals

When a company or agency uses digital seals, it should first determine the rules for use, such as:

- the scope of use of digital seals
- the description of a device for storing a private key used for creating digital seals
- the way of creating a digital seal (automatically or by a physical person)
- if required, a list or description of the documents to be certified with a seal
- if required, a list of persons authorised to create digital seals

The current practice is that the provider of a certification service includes a short description of the seal

together with its certificate in a public data communication network. As a rule, the short description contains the general purpose of use (the name of the seal) and a note whether a document needs both a digital seal and a digital signature of the owner of the certificate.

Opportunities for application

The introduction of a digital seal has provided practical opportunities for application between companies and their clients, and in records exchange in business communication. The instruments available include assurance of the authenticity of service contracts, client contracts, projects, approvals, technical requirements and the signatory's authority. Documents of evidential value, such as certifications, statements, certificates, copies and extracts, can be easily obtained from portals and websites or by e-mail and submitted where necessary. Electronic school-leaving certificates issued by the National Examination and Qualification Centre are a good example here. Among others, the State Treasury has introduced the digital sealing of documents sent to banks. It is also possible to digitally seal archival records and records with a long retention period that are stored in the electronic archives of state agencies. For instance, the National Archives intends to start using digital seals in creating capsules of digital archival records.

Assurance of the authenticity of service contracts, client contracts, projects, approvals, technical requirements and the signatory's authority.

When the digital seal application is integrated into an agency's information system, an employee can log in the system with an ID card and perform a secure processing, while the whole process is logged. Once the document is ready, it is sent for sealing to an automated file-signing solution that runs on the server. Although it is possible to seal a body of documents (a container), it is vital to seal each document separately. One service or agent can search for documents after a certain interval and automatically seal a portion of documents, and another service then sends the sealed documents forward.

For physical persons, digital sealing is more convenient than digital signing in case of mass authorisation. It is also possible to automate the process to avoid multiple entry of PIN2. An application for using such digital seals on chip cards is under development.

Conclusion

The opportunities of digital sealing can be expanded to further improve electronic records management. It is also planned to develop detailed guidelines for companies, state agencies and IT developers to instruct them on digital sealing and best practice in that field.

2.1.6.
THE ADMINISTRATION SYSTEM OF THE STATE INFORMATION SYSTEM (RIHA) IN 2009

PRIIT PARMAKSON
priit.parmakson@ria.ee
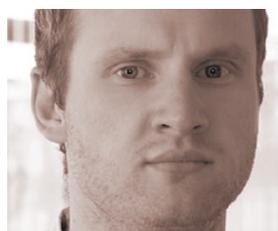
**EERO VEGMANN**
eero.vegmann@ria.ee
Estonian Informatics
Centre

An information society needs effective, efficient and interoperable information systems. The development of public sector information systems is a complex and multi-level process that involves all state and local government agencies, third sector organisations and IT companies. Public sector information processing has to be optimal and follow the principles of uniformity, transparency, state-of-the art technologies, and best practice in development and administration. Information systems are connected with each other through exchange of data and provision of electronic services. Their interoperability is based on common agreements and standards. Information processing must comply with the law, in particular data protection requirements.

RIHA – the accountancy of public sector information processing

In order to achieve the above goals, the state has to map and keep records of the state databases and information systems, the related infrastructure and various components. In Estonia, keeping account of public sector information processing takes place through RIHA, the administration system of the state information system.[37] RIHA is a secure web-based database and software application that supports various processes of public sector information systems and that stores systematic and reliable metadata about public databases.

It is a central database of state information systems and databases, and the e-services provided by informa-

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37   https://riha.eesti.ee (in Estonian only)
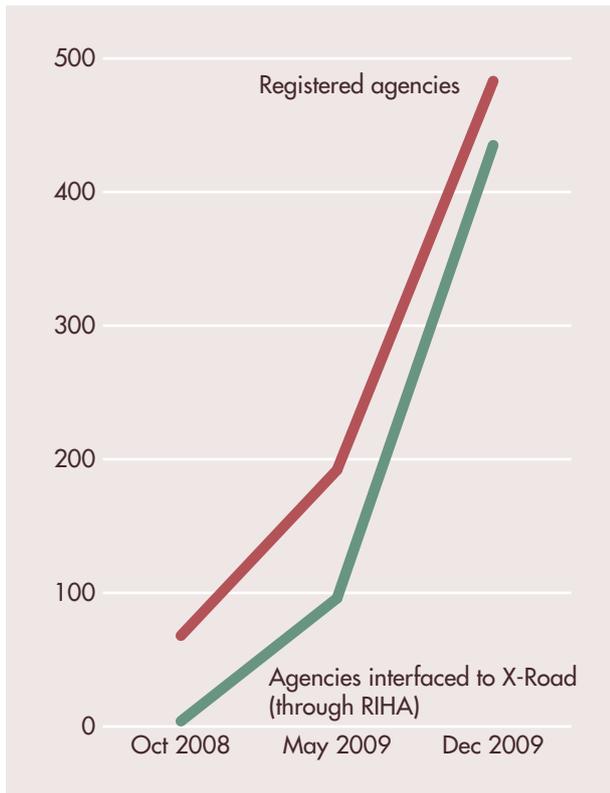
FIGURE 1. Agencies and enterprises interfaced to RIHA and X-Road

tion systems, such as the data exchange environment X-Road. RIHA contains the descriptions and approvals of all public sector databases (information systems) and classifications. In addition, RIHA hosts semantic assets (e.g. ontologies) needed for semantic interoperability. It also supports the administrative operations of the X-Road.

The objective of RIHA is to guarantee the transparency of administration of the state information system, planning for information management and supporting the interoperability of the databases of the state, local governments and persons in private law performing public duties. RIHA is used by all public sector agencies, IT companies offering development services to the public sector, and persons in private law performing public duties. RIHA is managed and developed by the Estonian Informatics Centre.

RIHA has undergone several development phases over the years. The gathering of data about the state information system started in 1997. First, only general data was collected and entered centrally. Therefore, the data were not sufficiently updated and were not beneficial to making decisions regarding the optimal development of the state information system. In 2008, a new web-based application of RIHA with extended functionalities was launched. In addition, a legal basis for gathering metadata was established by adding a chapter on the regulation of databases to the Public Information Act and by adopting a regulation on RIHA. The year 2009 saw the start of further developments to RIHA, which include

a new look for the system, increased user-friendliness and several new functions.

RIHA is unique in the entire Europe. Several European countries like Greece or Latvia have designed, in some form or another, registers of information systems. The uniqueness of RIHA lies in the scope of collected data (composition of data, descriptions of the services of the X-Road and of the functions provided to human users through a web interface, technical documentation, classifications, semantic assets, etc.) as well as the extent of it (all public sector databases are subject to description).

Information system descriptions available in 2009

By the end of 2009, 483 state and local government agencies and persons in private law performing public duties had interfaced to RIHA (390% growth year-on-year). For chief or authorised processors of databases, interfacing to RIHA is a prerequisite for performing their duties, such as entry or submission for approval of database documentation in RIHA.

The above figure shows the number of agencies that have interfaced to RIHA and to the X-Road through RIHA (a number of agencies interfaced to the X-Road earlier but not through RIHA). 435 agencies and persons in private law had also interfaced to the X-Road, the common data exchange layer of information systems. Interfacing to the X-Road allows agencies to interface their information systems and databases to those of other agencies, and to offer X-Road services.

Interfacing to RIHA and the X-Road gained considerable momentum in the second half of 2009. By now, almost all state agencies have connected to the two systems. Among others, many general education schools started to use RIHA and the X-Road in 2009. From among local governments around 25% have interfaced to RIHA, including less than a third of rural municipalities. 2010 will be the year of breakthrough regarding the interfacing of local governments to RIHA, as this is the year when two new central systems will be completed: a universal service portal for local governments (KOVTP) and an information system of local government/council sessions (VOLIS). This means that a number of new users can be expected.

At the end of 2009, RIHA contained the data of 450 databases and information systems. The Government Regulation No 58 of 28 February 2008 "Management

The objective of RIHA is to guarantee the transparency of administration of the state information system, planning for information management and supporting the interoperability of databases.
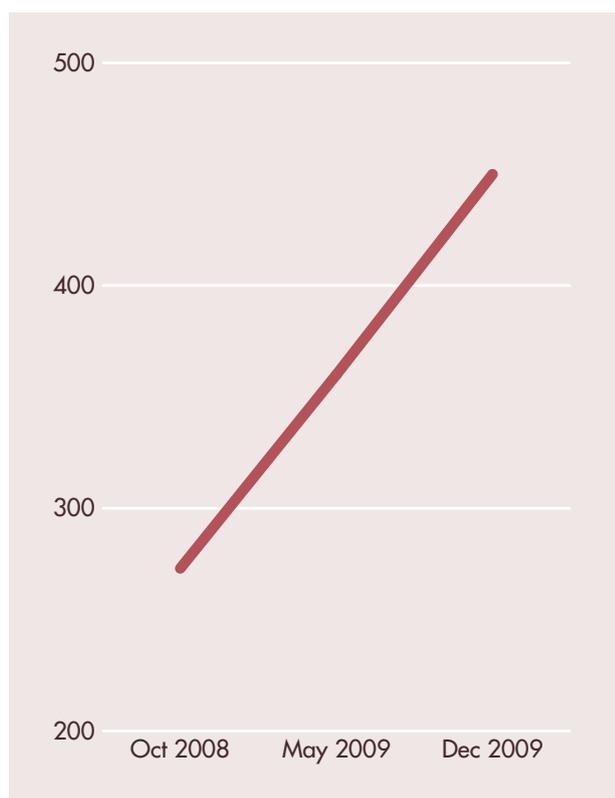
FIGURE 2. Total number of databases and information systems in RIHA

System of State Information System" sets out that the chief processors of databases are obliged to update the data transferred from the state register of databases to RIHA. At the same time, new databases have been constantly set up. In 2009, RIHA processed the establishment, launch, change of the composition of data or termination of operation of over 140 databases.

All this has required significant efforts from agencies in order to provide proper documentation of databases. The composition of data in major information systems contains 500–700 or even more data objects; dozens of services have to be described in the systems; and hundreds of pages of documentation are used in the development and management of systems. The launch of RIHA has required the take-up of new technologies, such as the XMI data exchange language or the OWL web ontology language. The number of systems managed by an agency may reach dozens. For instance, the Estonian Agricultural Registers and Information Board (PRIA) is managing around 20 information systems, while the Centre of Registers and Information Systems (RIK) is managing 22 information systems.

Several agencies, such as RIK, PRIA and the Ministry of Foreign Affairs to name a few, have completed description and approval of their databases. The rate

The rate of proper description of major state databases in RIHA is estimated at 80–90%.

of appropriate description of major state databases in RIHA is estimated at 80–90%. However, in 2009 there were also some ministries and agencies that had made only little progress in proper documentation and approval of databases.

In 2009, RIHA contained relatively few local government databases, except for the City of Tallinn, the biggest local government in Estonia, with its around 20 databases. It is quite understandable, as local governments have fewer resources available for describing their databases. Recently, the development of central IT solutions has gained considerable ground, and a trend of offering information systems as services has appeared. In such cases, model-based description is often used, which is expected to bring many new local government databases to RIHA in 2010.

Producing statistics on information systems is not among RIHA's main objectives. RIHA contains data that may be useful for different stakeholders involved in the development, management and use of the state information system, such as business sector representatives, IT departments and agencies managing information systems, supervisory authorities, auditors, strategic planners of information systems, IT development companies, people responsible for legislative drafting, etc. The data are relevant for making decisions regarding the optimal development of all state information systems.

RIHA contains data that may be useful for different stakeholders that are related to the development, management and use of the state information system.

None of the information systems are developed separately from other systems any longer. Before building a new information system several questions need to be answered first. Are similar data perhaps being gathered in an already existing database? Could the planned database use services of some other databases? System interfacing has become a common practice. As a rule, the new system requires exchange of data with other systems. It is not a rare case when the number of interfaced systems is ten or more. Interfacing is related to reuse, which is one the most important considerations in state information system development. The reuse of software solutions avoids duplicate developments. The reuse of data means that similar data are not required from citizens or entrepreneurs multiple times. Furthermore, the reuse of development experience contributes to the spread of best development practice.

Descriptions of services in the X-Road

RIHA has many functions, including the role of a catalogue of X-Road services. RIHA contains the descriptions of X-Road services of all databases belonging to the
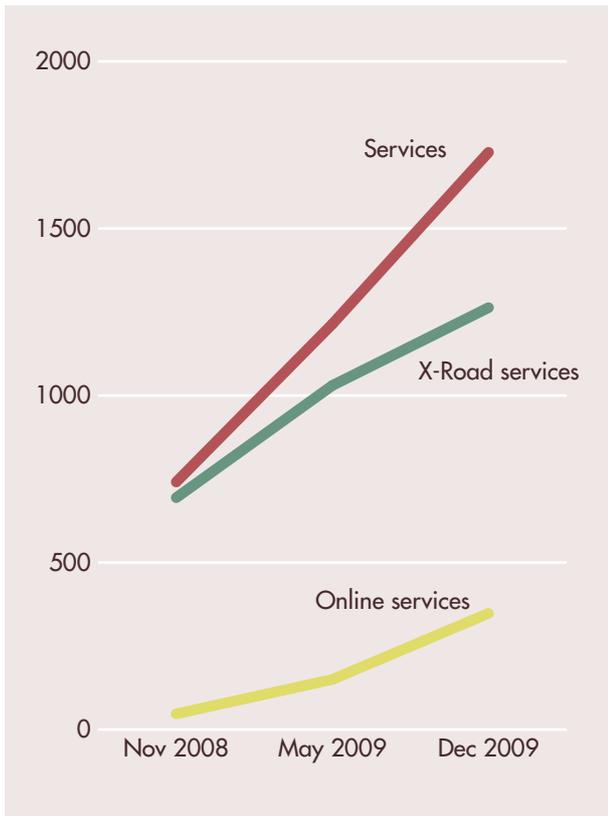
FIGURE 3. Services of databases in RIHA

state information system. Moreover, RIHA also manages the establishment and launching processes of X-Road services. At the end of 2009, the databases documented in RIHA were offering 1,263 X-Road services (around 70% growth year-on-year). The functionality provided to human users has been described in RIHA in the form of online services; the number of online services totalled 348 at the end of 2009. Information systems also provide a small number of other electronic and non-electronic services (issue of data by mail, consultations, etc.)

The number of databases interfaced to the X-Road, the central data exchange of the state information system, is constantly growing. 45% or 201 of the 450 information systems that are described in RIHA have been interfaced to the data exchange layer X-Road. As a rule, information systems are simultaneously service providers as well as users of services offered by other systems.

The presentation of databases in RIHA

RIHA offers information about databases throughout their life cycle. The presentation of a database starts long before the database is launched. When establishing a new database or information system, it is necessary to check whether there is a firm legal basis for processing these data, whether the data are not duplicated, and whether the database complies with the requirements set out in the Estonian IT Interoperability Framework. Therefore, before the start of development of a database, the chief processor enters the documentation of the database in RIHA and submits the database for approval.

Approval includes two steps: first the approval of establishing a database (before the start of development) and later the approval of launching the database. Databases that are no longer used are terminated.

In December 2009, 157 functional databases had been registered in RIHA.[38] Proper approval had been given to 52 databases that were under development.

The semantic interoperability of data

Achieving the interoperability of data requires regular work on the formats for submitting and changing data and on the standardisation of semantics. RIHA supports all major interoperability instruments: classifications, dictionaries and ontologies. The development of classifications gained momentum in 2009. In October 2008, only 27 classifications in RIHA complied with the requirements and had been approved. By the end of 2009, this figure had risen to 256, posting ten-fold growth. Ten classifications were in the process of approval and around 70 classifications were in the process of entry.

Compilation of classifications, dictionaries and ontologies to achieve the interoperability of data.

Progress with the compilation of more complex dictionaries and ontologies of semantic assets was slower than expected. In 2009, only one ontology was published in RIHA. The year 2009 also saw the beginning of preparations for building a repository of XML assets. The launch of the repository is planned in 2010. The repository will include XML schemas and other reusable descriptions and standards related to data exchange formats.

Conclusion

The development of RIHA continues in 2010. The ultimate objective is to include the descriptions of all Estonian public sector databases in RIHA. In order to achieve quantitative objectives, more attention should be paid to the quality of the data gathered in RIHA, which is currently quite inconsistent. Despite that, a big step forward was made in 2009 with database documenting and with developing RIHA into a central source of best practice. Further software developments are planned to expand the functionality and user-friendliness of RIHA.

38   Includes also databases that have been transferred from the old state register of databases to RIHA, but that have not been updated.

2.1.7.
AN XML TOOL FOR DRAFTING MACHINE-READABLE LEGISLATIVE DOCUMENTS

EVE AGUR
eve.agur@riigikantselei.ee
State Chancellery

Nowadays, the exchange of information and the amount of documents are increasing in correlation, which is why machines (computers) are needed for faster processing of information. It is no longer sufficient to have documents in electronic form and understandable for users. Now the keyword in information processing is interoperability between human-readability and machine-readability. The readability of documents by both humans and information systems is provided by the format of documents.

Objectives

In order to achieve interoperability, the public sector has established a strategic objective to make records management XML-language based. The State Chancellery is developing an XML tool for compiling and processing legislation, which can be easily used in a convenient user interface to create documents with complicated XML structure. The introduction of the tool will change user habits, but will not require knowledge of the XML language. The tool has been developed in accordance with the technical rules and complexity of legislative drafting.

The introduction of XML documents is a step forward towards ensuring the integrity of documents, as metadata is saved in the composition of documents and it is possible to monitor the process of legislative proceeding (the lifecycle of documents). The XML format is also a prerequisite for long-term storage of documents and complies with archiving requirements,[39] which ensures the authenticity, integri-

The introduction of the tool will change user habits, but will not require knowledge of the XML language.

ty and reliability of documents. All documents that are submitted for legislative proceeding must have these features, which agencies can ensure through their internal records management. The project involves all agencies that participate in legislative proceeding: ministries, constitutional institutions and gradually all local government authorities as well.

The tool is designed to help users draft XML documents that would comply with the technical rules of legislative drafting and that would be machine-readable by information systems. The XML tool is aimed at users who are not familiar with the XML language but have to draft XML documents.

The take-up of XML-based documents enables machine-readable processing for all parties of legislative proceeding. A transition to full machine-readability in the future requires further development of the information and records management systems of different agencies. The implementation of the XLM tool project is just the first step and the prerequisite for development.

Realisation of the project and general technical data

The XML tool VexPro is a freeware developed by Fujitsu Services AS together with Vertical Tarkvara OÜ on the basis of Eclipse[40] for free use both in Windows and Linux, while taking into account the specifications of legislative drafting and proceeding. There are no limitations on use or improvement of the tool, which means that in the future it can also be used with other types of documents, provided that new schemas and versions are first developed.

The software is not interfaced to other applications; documents are transferred and signed by using existing and well-functioning services, such as the records management system, the document exchange system, the data exchange layer X-Road, and the Digidoc software.

The XML tool includes options that are commonly used for compiling documents with text editors.

Legislative drafting is based on predefined schemas (document templates) that determine the rules and restrictions for the use of elements in documents. Documents are displayed by using the WYSIWYG (What You See Is What You Get) editor together with predefined style files.

In order to make XML documents human-readable, an XML tool or an information system view must be used. The user interface enables to convert XML documents into PDF documents, primarily for printout purposes but also for forwarding, if the document has to be readable. To display XML documents in web layout view, the application used in the information system of

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39   Requirements for archiving digital documents developed by the National Archives [http://www.ra.ee/public/Juhised/digidok_arhiveerimine.pdf, in Estonian only]

40   http://www.eclipse.org
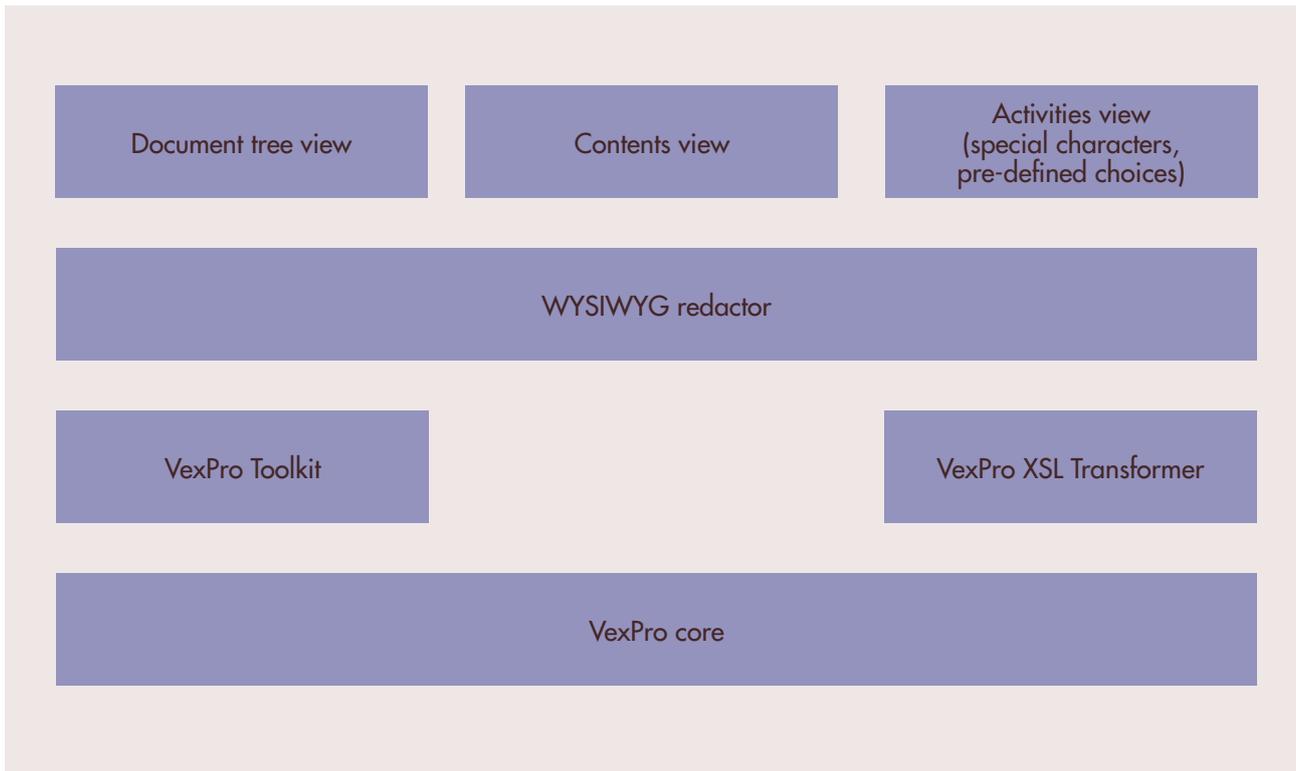
FIGURE 1. The following figure illustrates the general logic and architecture of VexPro

the electronic Riigi Teataja (State Gazette) can be used: XML document + XSL > XHTML, and CSS is also added to XHTML. Third information systems can use the style files of the electronic Riigi Teataja, which must be integrated in their general design framework. At the same time, it is necessary to avoid conflict between the definitions in the style files of the Riigi Teataja and the style files of a relevant information system.

Structure and options for use

The user interface of the tool is in Estonian, it can be installed on user's computer and it works without a web connection. The availability of a web connection is only necessary for automatic version updates. The tool includes options that are commonly used for compiling documents with text editors. Information can be submitted by entering data on predetermined fields or by choosing values; the tool also automatically provides default values. Default values for metadata (type of document, type of text, version date, name of schema, global ID[41]) originate from the schema of the document type or are generated au-

The new information system will be publishing only legislation complying with the XML structure.

tomatically by the tool. The user cannot change them. The metadata view displays fields that are used relevant document processing stages. The user can choose the stage and status of processing, and by changing them, stage-based metafields will be added for which values can be chosen or entered by the user. The changes made are stored as metadata versions in the content of an XML document, and a version number and date is given to the document.

The 128-bit global ID added to a document is considered sufficient to make it unique in the universe for at least a hundred years. The tool automatically adds a global ID to a legal instrument upon its generation. An XML document passes different stages of proceeding with the same ID, and new document versions are created and stored in various information and records management systems of agencies. The unique ID allows to find different versions of a document and to make them available for users. The XML tool also adds global element-based IDs, which allows to add and store references and links. Adding a global ID to a document does not impose limitations on adding an information-system based identifier.

In the case of a legal instrument (template), the tool creates the following content elements: title, preamble, part, chapter, division, subdivision, sub-subdivision, section, subsection and clause. It is also possible to insert tables, images, PDF files and HTML fragments to a document, and to use special characters, emphasising elements (bold, italic, underline), superscripts and subscripts.

41   Global ID is a standardised algorithm that is used to generate a unique 128-bit identifier at any point in space, which can be used by different operation systems, platforms, etc. It takes into consideration time and the ID of the processor and guarantees that it is not possible to generate the same ID at two different points in space and time.

Other additional tools and commands for creating documents include:

- track changes
- add comment
- cut, copy and paste
- delete an element
- relocate a single element or a group of elements together with their sub-elements in a structure tree
- insert a reference, a note on the technical rules of legislative drafting, an explanatory note, an appendix, error correction or a signature (text field)
- create a print preview and print
- check document's compliance with the XML schema (validate)
- saving: as a PDF file for printout or as an *.akt file for forwarding
- metadata

During the project, schemas have been developed, on the basis of technical rules of legislative drafting, for acts, regulations, individual acts and their amendment acts. The different versions of the schemas will be stored in RIHA's repository. The schemas have been developed in accordance with the State Chancellery's guidelines for creating XML data descriptions of document types.[42] When creating a new version of a schema, the existing elements are not changed but new ones are added, so that earlier schemas are operable too.

Introduction and implementation

The success of the project depends on the introduction of the tool. Transition to XMP based document formats means that a lot of users require relevant training to acquire new skills. Another bottleneck for forwarding a document might be the distributed inclusion of information and records management systems that follow different user logic.

The first phase of introducing the tool involves ministries and agencies servicing constitutional institutions that are responsible for legislative proceeding until publication in the Riigi Teataja. Before introducing the tool, the processing of documents with the tool must be enabled in the draft coordination information system (eLaw), the information system of Cabinet sessions (eCabinet), the information system of draft legislation of the Riigikogu and in the electronic Riigi Teataja. The first phase of introduction will be completed by the end of the first half of 2010. A new version of the electronic Riigi Teataja[43] will be adopted at the beginning of the second half-year. The new information system will be publishing only legislation that is in compliance with

the XML structure and that have been created using a relevant document template (schema).

The Government has submitted a draft Riigi Teataja Act to the Riigikogu to establish the prerequisites for introducing the new electronic Riigi Teataja information system and for launching new legal advice services that are based on the XML standard.

2.1.8.
THE ESTONIAN SCHOOL MANAGEMENT INFORMATION SYSTEM

MART KALLASTE
mart.kallaste@hm.ee
Ministry of Education and Research

The idea of establishing a single central management system for educational institutions came up in 2005. It took little time from idea to implementation, as research and surveys had indicated that the more than 1,500 educational establishments in Estonia had been managing their information independently or in accordance with guidelines from local governments. There were dozens of basic or more complex information systems, some of them running on open source and others on commercial software. Many of the applications had been developed by school enthusiasts, including students. Some schools, however, lacked resources for digitalising their records management and were still struggling with traditional paperwork. The Ministry of Education and Research carried out a broad-based survey among different types of educational institutions to identify the need for a central information system and expectations regarding the content of such system. The results of the survey did not leave any doubt, and so it was decided to establish the Estonian School Management Information System (EKIS).

The development of the information system followed the usual routine: a detailed analysis, public procurement for implementing the detailed analysis, training, and launch of the system. It was decided to give free hands to schools in determining the necessary functionalities. The design of the information system included the following modules: communication, file and records management, personnel administration and recording of working time, management of inventories and rooms, management of library, financial accounting, organisation of enrolment, and system administration. As EKIS is a central system, it was not possible to implement it in full flexibility.

Schools were given free hands in determining the necessary functionalities.

File and records management is the most complete component of the above listed modules. It includes a complete document processing environment, a document register and an interface for the publication of documents, group work options and document templates. It was also the module most required by schools.

The communication module gives a comprehensive picture of school life through news and notifications as well as individual, group, school and inter-school calendars. By integrating the functionality of EKIS with a school's website it is possible to create an informative public website.

The information system was launched on 1 January 2008, when access to EKIS was provided to all those educational establishments willing to use it. A number of trainings were also organised for different target groups. The partners of the Ministry of Education and Research in the system's introduction phase were Columbus IT AS and Webware OÜ.

An informative public website can be created by integrating the functionality of EKIS with a school's website.

The Ministry registered EKIS as its trademark on 1 June 2009. The system runs on an open source records management platform Webdesktop and an open source database PostgreSQL 8.1.

In spring 2009, the Tallinn Education Board decided to support the interfacing of schools with EKIS and to promote paperless records management, which marked another milestone for the system. The Ministry of Education and Research commissioned further developments and consequently EKIS was interfaced to the state information system through the X-Road data exchange layer and to the document exchange centre (DVK).

EKIS now also includes new user groups, such as pre-school establishments and hobby schools. At the beginning of 2010, EKIS contained 471 institutions (user IDs have been issued to over 500 establishments), a total of 3,074 users and over 400,000 entries.

To conclude, the Estonian School Management Information System has been successfully launched and it has entered the active use phase of its lifecycle.

2.1.9.
PAPERLESS RECORDS MANAGEMENT AND DEVELOPMENT OF PARTICIPATORY DEMOCRACY IN LOCAL GOVERNMENTS

KALLE TOOMET
kalle.toomet@kehtna.ee
Kehtna Rural Municipality
Government

eGovernment means the use of information and communication technologies in public administration in respect to changes in work organisation and new skills in order to improve public sector services and democratic processes. The development of information technology has broadened the scope of providing public sector services to meet the changing needs of users. Local governments should be an interoperable part of eGovernment and information society.

Project structure

In summer 2009, when funding from structural funds was allocated to modernise records management systems for transition to paperless records management between agencies, it was decided to simplify records management between citizens and local government officials. The project is managed by Kehtna Rural Municipality Government (Rapla County) and it involves 70 local governments all over Estonia. All these local governments use the records management and processing software of Amphora. The project aims to implement digital records management and e-services in local governments.

The project involves city and rural municipality governments and councils, and their sub-offices. A single records system of local governments and sub-offices would facilitate effective communication and decision-making between officials, which in turn enables them to offer services to households and entrepreneurs faster and more conveniently.

Project implementation and progress is monitored by the project steering group. The steering group involves all active partners that are responsible for the daily development of the project, which enables to analyse the developments with the users and contributes to achieving the goals of the project.

Digital records management

The public sector has set itself the objective or providing digital records management. From where local governments stand, this means offering faster information society services to citizens and entrepreneurs. Documents and records are the primary output of local governments, reflecting the decisions adopted and the work done. Internal digital records management or the back-office is the foundation for e-services and participatory democracy. For better records management in an electronic environment, the following areas will be improved during the project:

- access to public information for citizens and their inclusion in decision-making processes
- records archiving
- exchange of information with state registers
- the "desk" of the official

Apart from the need for digital creation and exchange of records, it is also necessary to store them digitally. Therefore, one of the project objectives is to establish a digital archive module, so that local governments could do all kinds of archival procedures electronically in an information system, rather than on paper. The archiving functionality will be two-level to take into account the needs of users: an intermediate archive for storing records not actively used, and a complete archive of records not subject to delivery to the National Archives. Delivery of records of archival value to the National Archives is planned through the document exchange centre (DEC)[44]. Records can also be forwarded to other locations or systems (e.g. for integration of systems when agencies are merged, or for using external services for long-term preservation of records).

Disclosure of information

In 2008, the National Audit Office of Estonia launched an initiative *Everyone's rights in e-state*[45] or simply the e-state charter, which gathers principles of efficient administration and informs people of their rights and administrative agencies of their development goals. The charter presents ten key principles and criteria for evaluating these principles. The project contributes to the implementation of these principles and to increasing the quality of public sector e-services.

In compliance with the Public Information Act, citizens will have convenient access to the document registers of local governments. As documents are made public by officials, special guidelines for disclosure were compiled in the first stage of the project to instruct local governments on how to make the necessary settings to implement the Public Information Act. It should also be noted that by now all project partners have reorganised their public document registers. In other words,

44 http://www.ria.ee/dec

45 http://www.riigikontroll.ee/LinkClick.aspx?fileticket=n9QQmXYiTmA%3d&tabid=113&mid=760&language=etEE&forcedownload=true (in Estonian only)
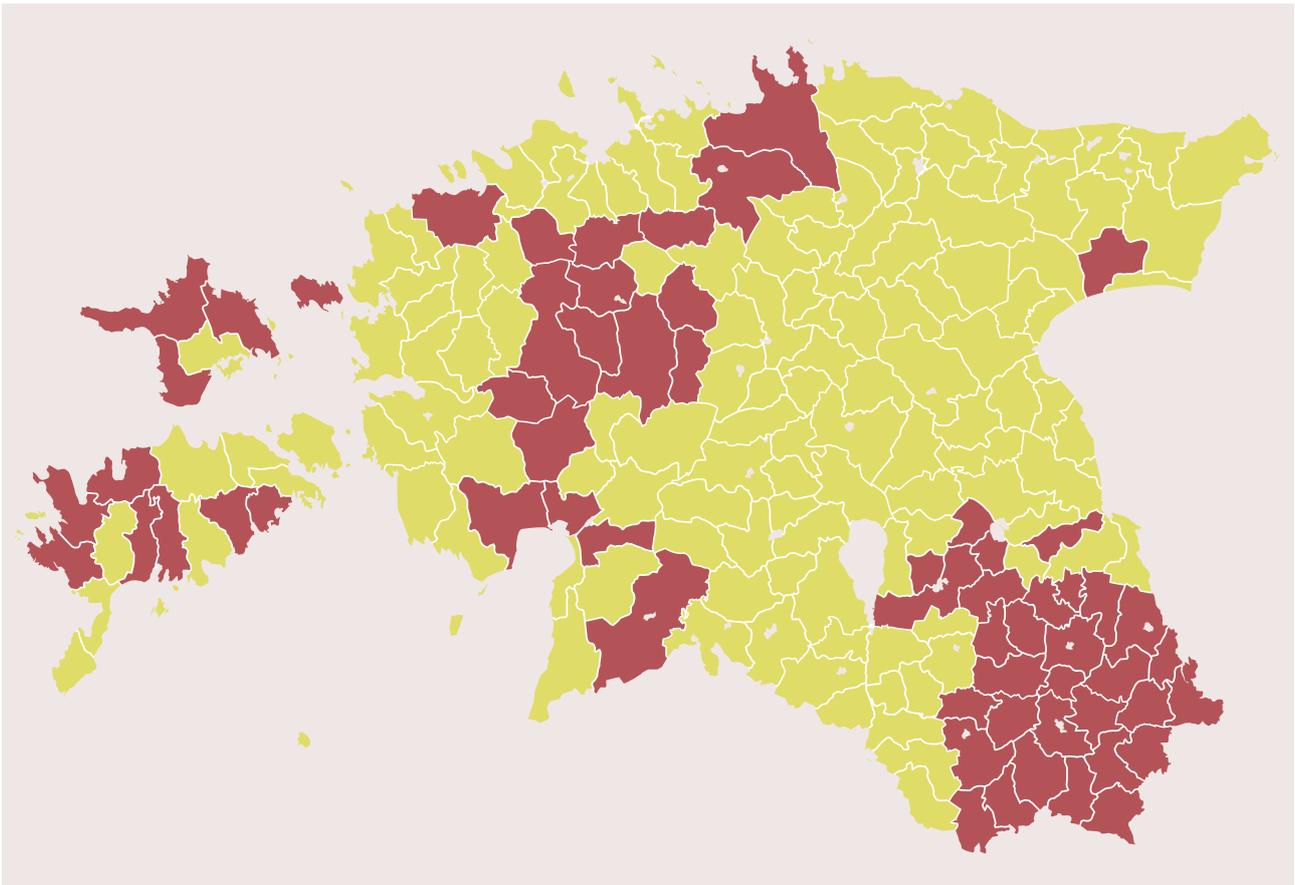
FIGURE 1. Local governments participating in the project (marked with red)

a considerable amount of local governments are able to comply with the Public Information Act and to ensure better information flows for citizens willing to monitor local government processes.

The e-state charter also sets out that everyone has the right to request information on the status of his or her application, or in other words, how far along in the process the application is. As a result of the project, people will be able to identify the officials responsible for processing their applications, while adhering to requirements of personal data protection, as procedural information will be disclosed only to authenticated users and only on the records of these particular users.

Interbase cross-usage of data

For the integral functioning of the public sector, it is important that local government services be provided to residents and entrepreneurs as an integral and interoperable environment, instead of being scattered between the information systems of different ministries and meeting sectoral needs. Apart from avoiding duplicate requests of data from people, agencies must also optimise their internal work processes to ensure efficient use of time and resources.

The information systems and databases should be interfaced, so that officials need not make queries to a number of different databases in order to process applications in their own information system. This would

be a half-way solution if the take-up of information and communication technologies reduced the amount of paperwork for citizens, while increasing the workload for officials by making them gather records from different databases.

The development phase of the project includes various improvements that will eventually make the working environment of officials more user-friendly, while enabling faster servicing of citizens. One of the largest and most complicated developments is the interfacing of the existing records management application with several state registers (the population register, the commercial register, the register of economic activities, the land register, and the register of construction works). This serves to simplify the work of officials, to speed up processes, and to reduce duplication of information in registers and data exchanges. Data will be exchanged via the X-Road portal, which will use the data of databases to generate records. At the same time, the data in the state databases should be regularly updated.

People can request information on the status of their application.

Inclusion of residents in the local community

Participatory democracy has been gaining ground in re-

cent years both in Estonia and the rest of the European Union. The state and local governments must facilitate the inclusion of citizens in decision-making processes, ensure their timely information, and create an environment for them to have a say in state matters. People can participate in resolving matters of public concern, as local governments provide them with easy and convenient tools for expressing opinion and making proposals.

Therefore, one of the project objectives is to create opportunities for including citizens in local government decision-making processes. Citizens who are authenticated with an ID card or a mobile ID will be able to comment on documents and to express their opinion

Opportunities to comment on documents and to express opinion.

of draft legislation and other documents leading to local government decisions. RSS feeds will be created of disclosed information, and the agendas of council and local government sessions will be made public by developing similar solutions as used in the information system of local government/council sessions (VOLIS), which is currently under construction in the Ministry of Internal Affairs. In addition, citizens will be able to comment and vote on local government draft legislation, just as in the service portal for local governments (KOVTP), which is another project of the Ministry of Internal Affairs.

The importance of training in ICT uptake

Besides the availability of information and communication technology, it is important to organise training for the use of ICT for a smooth transition to digital records management. A survey commissioned by the State Chancellery in 2006 to identify the long-term training needs of local government officials showed that two thirds of office workers require training in records management. The survey also revealed that in the future all local government officials should receive IT training, given that the role of information technology is steadily increasing. Participants in the training for rural municipality and city secretaries in 2007-2008 gave similar feedback, pointing out that all officials could benefit from training to facilitate the transition to digital records management.[46]

The current project has confirmed the importance of training in the take-up of new technologies. The majority of Estonian local governments have obtained electronic records management systems, primarily for compliance with the requirements set out in the Public Information Act. However, they are using only some of the multiple functionalities available for efficient records management. Scarce financial resources have put limitations
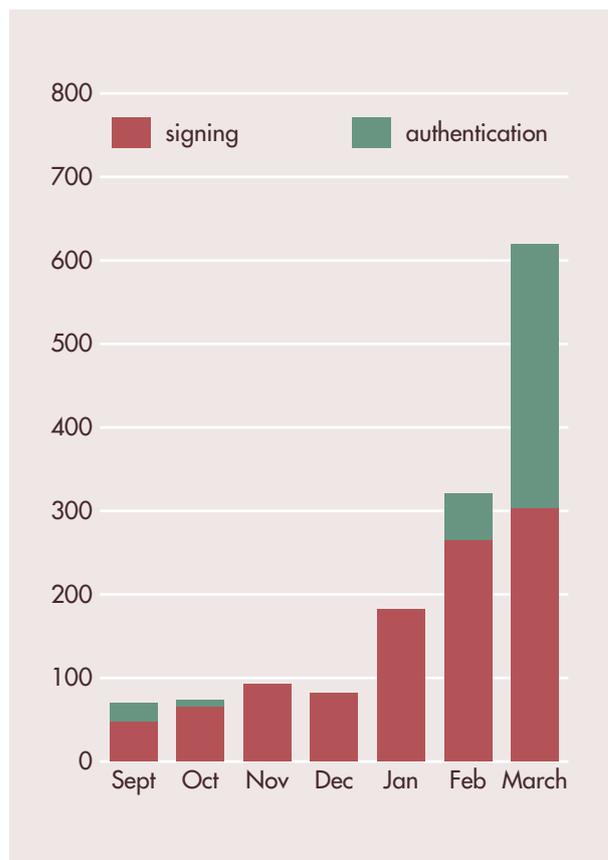
FIGURE 2. Increase in digital authentication and signing during the project (2009–2010)

on organising training for all, as funds are often available only for software purchases and training of a limited number of officials. This, however, affects the efficiency of internal work processes. Based on the data of the Certification Centre, during the project both digital authentication and signing has increased in the participating local governments (see Figure 2)[47]. This can certainly be attributed to the training carried out in the project development phase.

Problems and achievements

Local governments are responsible for organising social assistance and services, youth work, housing and utilities, the provision of public services and amenities, waste management, physical planning, public transportation within the rural municipality or city, the maintenance of roads and streets, and the maintenance of pre-school child care institu-

The project confirms the importance of training in the uptake of new technologies.

tions, schools, libraries, community centres, sports facilities, care homes and other local agencies. In 2006, the State Chancellery audited local governments in

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46   See Article 2.1.7 at
      http://www.riso.ee/en/files/Yearbook2008/html/Yearbook.html

47   Does not include the data of those project partners, whose software is located in their own servers.

terms of their success in implementing information technology solutions. The audit report highlighted that besides local-level initiatives for local inhabitants (e.g. the Tiger Leap project, the Village Road, the establishment of Public Internet Access Points) attention should be paid to local governments' own needs and problems.

Considering the size of local governments and the broad scope of their responsibilities, many of them, unlike state agencies, do not have document managers who would primarily be responsible for organising internal records management, developing related information systems and providing training to other employees. The biggest problems encountered during the joint project concern coordination, sufficient human resources and the opportunities and willingness of partners to actively contribute to the developments of digital records management in order to make maximum use of their feedback in the project testing phase. Nevertheless, meetings and discussions have been held, common standpoints have been formulated, and guidelines have been developed.

> *The uptake and development of ICT also brings about changes in the current work arrangement.*

The uptake and development of ICT also brings about changes in the current work arrangement. Given that the public sector is heading towards transition to paperless electronic records management, many smaller local governments are not able to keep up with others on the path to the information society because of scarce funds and human resources. They sometimes also lack courage to explore other functionalities besides registering documents, such as procedures or archiving. Therefore, transition from document registers to digital records management is of utmost importance. The accompanying risk is that once the transition is on the way and it then halts for some reason or another, this will result in double work and dissatisfaction of citizens. However, the discussions held in different phases of the project have helped identify potential problems and bottlenecks so as to analyse them and take preventive action.

> *Partnership gives considerably better results than individual development plans.*

In order to guarantee a wide implementation of the project results, every project participant or local government can involve two sub-offices whose working environments are adjusted in accordance to the needs and requirements of digital records management. Surprisingly, the sub-offices of local governments have been rather inactive. The underlying reason may be that they have a small amount of records, and they do not feel the need to introduce an information system for records management. Educational establishments can adopt a special application commissioned by the Ministry of Education and Research, the Estonian School Management System (EKIS).

The strength of the project lies in the joint efforts and partnership of local governments, which gives considerably better results than individual development plans. Compared to the level of local governments in general, a joint software project allows for in-depth analysis of users' needs and for high practical value. Thus, besides achieving the objectives of the project the synergy between project partners should be highlighted.

A joint project is also financially more feasible, as local governments have similar needs that serve as an input for the planned developments. If each local government commissioned developments separately and in consideration of its own funding and skills, the total cost would be much higher.

Conclusion and future plans

The project was launched in 2009 and it will be completed in summer 2010, when all participating local governments will be able to enjoy the project outcomes. The rise in efficiency that stems from the developed applications remains to be seen, as the integration of these applications in the working processes of project participants takes a while.

Kehtna Rural Municipality Government is open to joint development projects also in the future. The Estonian Informatics Centre has launched a project of eInvoicing, which aims to establish functions for the receipt and display of XML based electronic invoices. Kehtna Rural Municipality Government participates in the pilot project of eInvoicing, while also using the experience gained from the project of paperless records management.

Once the project of paperless records management and development of participatory democracy in local governments will be completed, all the participating local governments and their sub-offices will have a records management system that enables to provide citizens effective, fully electronic and rapid records management services that are compatible with other state structures. The Amphora software used for this purpose can be adopted also in other interested local governments.

2.2. Provision of user-friendly e-services

2.2.1.
EESTI.EE IN 2009

EERIK HANNI
eerik.hanni@eesti.ee
Estonian Informatics Centre

Central Internet portals have been developed in Estonia already since the end of 1990s. The Single Point Entry, initially as an official tool providing an overview of the public sector, expanded to become a portal of larger coverage. For example, among other things, its users were asked whether criminal punishments should be toughened or if Estonia should join the European Union.

The start of this century saw the emergence of different specific portals – for citizens, for entrepreneurs, for officials, an information portal, and an eGovernment portal – that offered the first e-services, introduced state administration, or gave clear and simple guidelines regarding public services and the rights and obligations of citizens. By 2008, all these were merged into a single integral state portal eesti.ee[48], which gave access to various information and e-services, which had up to then been rather dispersed.

However, this solved only some of the problems. Everything was available in one place, but it was difficult to find the necessary information. It was inconvenient to use the large portal with a complex structure. The portal development team from the Estonian Informatics Centre (RIA) decided that the only way to make further development of the portal more user-friendly was to include volunteers; that is, citizens from different walks of life, with different education, of various age and with diverse experience in Internet usage.

Concentration and single access point of information and e-services.

The keywords characterising activities related to the portal eesti.ee in 2009 are *involvement* and *ease of use*. An introductory campaign was organised at the start of 2009. As a result, more than 600 people responded to the call for help to improve the portal. Feedback on the development and user needs of the portal was thorough and constructive, and helped to increase the ease of use. Taking into account that the amount of information and services in the portal will inevitably expand, it was imperative to think about the consolidation of the information architecture and the sustainability of the portal. It was decided that future developments would put extra emphasis on the ease of use. The first step was to analyse how user-centred the portal was in order to design a user interface that is convenient to use and in line with the main accessibility requirements, to improve the information architecture, and to describe possible new and necessary functions. The analysis was completed at the start of 2010 and the identified developments will be completed this year. The project included several tests, which were carried out with the help of volunteers.

Future developments will put extra emphasis on the ease of use.

Developments

The state portal's future goal – to become the centre of public services and information – was set in 2009. The goal will be achieved, when all public sector e-services and information on public services will be easily accessible through eesti.ee. To this end, it is necessary to create favourable conditions for partners (public sector institutions) for adding their services to the portal and introducing the portal to users.

The analysis of the portal's user-centeredness was the first stage of more extensive development work, which will, for the most part, be completed in 2010. On the one hand, looking at the ease of use, it proved necessary to modernise the information architecture and the user interface, and to devise additional functions for the latter. On the other hand, it was necessary to update the infrastructure of the portal to ensure its sustainability. In order to enhance functionality and facilitate adding new services to the portal, it was decided to decrease expenditure on further developments and to ensure the sustainability of the technological framework. To this end, it was started to create usage capacity to portal components developed in Java programming language. Java is very widely used, so there are considerably more competent experts in the market compared

to specialists able to carry out developments using the previous framework. Thus, competition among development work providers will tighten, while increasing quality and decreasing the cost of developments.

A drop in expenditure will affect not only RIA's developments, but also those commissioned by partners, thus contributing to easier and cheaper design of new e-services. In 2010, a project for more detailed documentation of services will be launched, which will also facilitate the management and development of services for RIA administrators and partners.

One of the most important semantic developments in 2009 was the diversification of information and services to enterprises, to be continued also in 2010. In relation to the transposition of the EU Services Directive at end-2009, Estonia assumed the obligation to ensure that all EU service providers or those intending to start offering services have easy access to information about regulations on the provision of services in Estonia and carry out all relevant administrative operations and formalities (e.g. application for activity licences, submission of reports). Such points of single contact are set up in all EU Member States and in some countries also in smaller administrative units, either in physical or electronic form. In Estonia, the point of single contact will be available in the State Portal's section for enterprises.

The point of single contact provides information and services for enterprises in the State Portal eesti.ee.

In order to meet the goals of the point of single contact, an analysis of user needs was conducted already in 2008. In 2009, the goals were specified and work was started to write new articles for the portal, to reform contents administration, and to design new functions. The development goal was to help entrepreneurs find information and documents in all necessary fields of activity. Among other things, the portal will include step-by-step instructions on how to communicate with the state and e-services for performing business-related administrative operations. In addition, there will be personalised information: reminders of deadlines, of requirements to be met in the entrepreneur's registered field of activity and notifications of amendments in laws concerning the registered field of activity. The developments will be completed in 2010.

Infrastructure of e-services

The amount of public services offered by RIA is minimal. Thus, the role of RIA as the developer and administrator of the State Portal is rather to promote the launch of new e-services and to introduce and create new possibilities.

This means that as a rule, the State Portal itself will not come up with new services. Most of the services have a provider, a public sector institution, who has

found that traditional provision of services is expensive, inefficient and inconvenient and has decided to launch its e-service(s) in the State Portal. For instance, in the autumn of 2009, the portal started offering the service of notarised documents query. This means that everybody is now able to find their notarised documents from the eNotary information system of the Chamber of Notaries and the Centre of Registers and Information Systems.

The State Portal offers public sector institutions a diverse e-services infrastructure:

- notification services – for sending people location-based, personal and mass notifications by e-mail and SMS
- authentication services – for identifying users through an ID card, Mobile ID or an Internet bank and directing them to an external information system
- rights management services – for managing rights and authorising info queries in the X-Road to, for example, set restrictions on the users of a service or function
- e-forms – for designing electronic applications that are easy to prepare, accept and process; a new and more advanced technology will be applied in 2010
- the X-Road queries layer (PEPE) – for creating user interfaces to various X-Road services
- lemmatiser – for deriving the base form of Estonian words, comes in handy when making searches

Notification

The majority of webs operating for business purposes assess their success according to the number of users or clicks received, the time visitors spend on their website and some other objective indicators. These criteria are easily translatable into prices and make it possible to meet the goal of the company, to earn profit. The State Portal is not oriented to earning profits or increasing the number of users or clicks, just like the Unemployment Insurance fund does not aim at enlarging the number of the unemployed, or the Social Insurance Board does not intend to scale up the number of pensioners. It is important that people be aware of and able to find the public services they need, for example, information and e-services available through eesti.ee.

It is important that people be aware of and able to find the public services they need.

In 2009 and 2010, several information campaigns were carried out all across Estonia to raise citizens' awareness of the State Portal through media channels and also face to face communication. The information campaign of the start of 2009 nearly doubled the number of regular portal users. Eesti.ee benefited from the increase in the amount of users by reinforcing its position as the centre of e-services and information in the eyes of its partners. In addition to notifying users,

the campaigns also targeted potential partners to demonstrate the opportunities of the portal and the simplicity of developing e-services. In addition, a seminar was organised in August to establish contacts with partners. Participants included mostly public sector representatives, but also people from development companies. The seminar participants were introduced the essence, objectives and technical options of the portal to show that the design of services on the state portal's infrastructure can considerably decrease their efforts.

Taking into account the inadequateness of the objective criteria used in the public sector for assessing the use of the State Portal, there is a need for a user-based feedback system to improve the analysis and interpretation of user statistics. So far, the annual surveys of the Department of State Information Systems "User satisfaction with public e-services" have been used for this purpose. The survey allows a general reflection of the State Portal, but does not, however, provide immediate feedback necessary for the daily functioning of the portal.

In 2009, a logo was designed for the portal to increase awareness of the portal through memorable visual identity.

EESTi.ee

Gateway to eEstonia

Statistics of use

eesti.ee is holding the third place after the electronic Riigi Teataja (State Gazette) and the city of Tallinn among public sector portals that have published statistics on their use. In 2009, the State Portal was visited by 965,000 unique users, which is 60% more than in 2008. The number of visitors reached a record of 18,200 on 16 February, when declaration of income started. High visit rates were also related to the disclosure of state exam results and information campaigns at the start and end of the year. The average number of visits a day increased from 2,000–3,000 in 2008 to 7,000–8,000 in 2009. Nearly half of the users authenticated themselves in the portal and used the portal's services. The most popular services were viewing data on benefits for incapacity for work, statistics on names, results of state exams, and queries for one's own data in the Population Register.

2.2.2.
THE USE OF AND SATISFACTION WITH PUBLIC SECTOR E-SERVICES

KRISTINA RANDVER
kristina.randver@emor.ee
TNS Emor

The Estonian Informatics Centre commissioned a survey on citizens' satisfaction with public sector e-services, which was carried out by TNS Emor in January 2010. The survey was commissioned under a EU Structural Fund programme for raising awareness of information society and funded by the European Regional Development Fund. The main objective of the survey was to identify the awareness of Estonian residents aged 16 to 74 about public e-services and state portals, and to assess the use of and satisfaction with the services. The survey consisted of personal interviews and involved 1,020 respondents aged from 16 to 74.

The Estonian adult population uses the Internet actively. Around 777,000 people, or 76%, of the residents aged from 16 to 74 have used the Internet or e-mail at least once in their life (see Figure 1). The young discovered the Internet over ten years ago and the majority of them are currently using the Internet, while older generations have discovered the Internet only in recent years. For instance, around 10% or 13,000 of people aged from 65 to 74 were using the Internet in autumn 2007, whereas at the beginning of 2010 that indicator was almost three times higher at 28% or 36,000 people. A rise in the number of users aged +50 is mainly expected for the coming years.

The awareness of Estonian residents aged 16 to 74 about public e-services and state portals, and the use of and satisfaction with the services.

Almost every third non-user does not use the Internet because they lack skills or a computer and it is too expensive to get one. Both of these trends are rather down, while at the same time the share of people who do not need the Internet or do not perceive the benefits of that has grown from 15% of non-users in 2007 to 35% in 2010. Money plays a significant role primarily for the non-users living in major cities, having lower incomes and aged over 50 years.
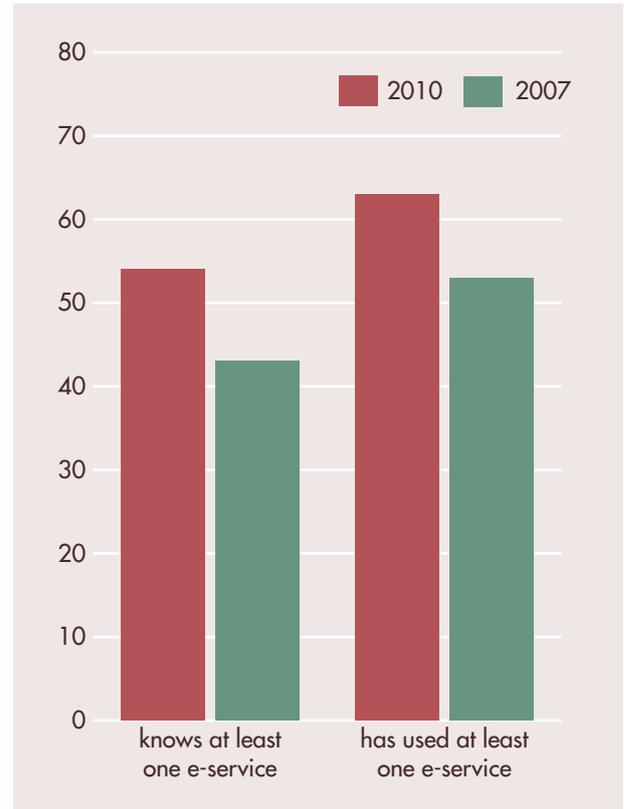
FIGURE 1. Use of Internet among Estonian residents aged 16–74 (% of all respondents)

FIGURE 2. Awareness and use of public sector e-services among Estonian residents aged 16–74 (% of all respondents)

70% of the non-users do not intend to start using the Internet in the future either. The majority of them gave lack of money or Internet skills as the reasons for non-use. The older the non-users, the more complicated the Internet seems to them and the less likely they will ever start using it. 10% of the non-users will adopt the Internet as soon as they have financial resources to purchase a computer or an Internet connection, especially as regards residents and unemployed non-users of Tallinn. So, if all the obstacles were removed, there could be 838,000 or 82% Internet users among the Estonian population aged from 16 to 74.

People's awareness of public sector e-services has grown in recent years. Two years ago 57% of the target group could not name a single e-service, where-

People's awareness of public sector e-services has grown in recent years.

as now this figure has risen to 41% or around 422,000 people. Awareness of e-services is lower among the residents of Southern and Northern Estonia, non-Estonians, people aged from 50 to 74, those with lower education and incomes, non-workers (including pensioners), and skilled and unskilled workers. Awareness is higher among Internet users, although 29%, or around 229,000 people, were not able to independently name any of the public sector e-services. Electronic tax declaration and other eTaxBoard services are the most well-known, as

22% of all residents aged from 16 to 74 and 28% of all the Internet users were aware of them.

The use of public sector e-services does not necessarily mean that the user associates it as such – 20% of residents who had used some e-service still could not name any. Two years ago this figure stood at 28%, but the number of e-service users was lower then too.

Together with increased awareness, the number of e-service users also has grown. Around 83%, or 647,000, Internet users have used

Tax and financial sector e-services are the most popular, with the number of users reaching 543,000, or 70% of the Internet users.

at least one public sector e-service, accounting for 63% of all the residents aged from 16 to 74. Women, people aged from 25 to 34, people with higher education and incomes, and those with a profession tend to make more use of public sector e-services. The same applies to students.

The e-services of the tax and financial sectors are the most popular ones with the number of users reaching 543,000 or 70% of the Internet users. Most of them have filed income tax returns electronically and 75% have used an Internet bank to pay for public services or state fees. The number of users of both of these services is constantly growing.

Around 331,000 people or 43% of the Internet users aged from 16 to 74 have used the e-services of education. Communication with school and teachers (through the eSchool environment or by e-mail) is the most popular e-service in that area. Every fourth user of education e-services has participated in electronic trainings or courses.

Approximately 217,000 or 28% of the Internet users have used social or medical e-services. Although the total number of users of social or medical services has been stable for the last couple of years, the number of users of specific services within these areas has risen. Medical information is the most common search target, followed by registering for a doctor's appointment and applying for a European health insurance card (54% and 42% of the users of social and medical e-services respectively). Registering for a doctor via the Internet and applying for family allowances or parental benefits have also gained popularity.

Every fifth Internet user has given an electronic vote at the elections or used electronic land and geo-information services. The number of e-voters grew considerably as a result of the elections in 2009. Applying for an identity document (passport or ID card) thought the Internet is another service that is gaining increasing popularity.

Every fifth Internet user has given an electronic vote at the elections.

In general, around 484,000 or 75% of the users are very satisfied with the public sector e-services (see Figure 3). Satisfaction with different aspects of services is high as well, and it increases together with user experience and with improvements to these services. Positive feedback is usually given to e-services that involve regularity and long experience, such as electronic income

tax returns. Many users find that e-services help them save time, as they can find information faster and spend less time on bureaucracy and communication with state agencies.

When searching for information about e-services, every second resident would first use a search engine, every tenth would ask a friend or family member, and just as many would use the State Portal eesti.ee. Search engines are preferred by the young, residents of Tartu and Jõgeva counties, the employed, students and people with higher incomes. Friends and family are preferred by older people, residents of Northern Estonia and rural regions, and the unemployed. The eesti.ee portal is preferred by Estonians, residents of Northern and Western Estonia, the employed and people with higher incomes.

The most well-known portals are riigiteataja.ee and eesti.ee.

The survey focused on the reputation and use of four state portals. The most well-known portals are riigiteataja.ee and eesti.ee; 46–47%, or around 474,000–478,000, people aged from 16 to 74 have heard about them. Two years ago only 24% of residents aged from 15 to 74 had heard of these portals, which means that awareness of both portals has doubled since the last survey. eesti.ee gained popularity very suddenly, while riigiteataja.ee has gradually become known. Internet users are considerably more aware of all the portals, as 59% of them know riigiteataja.ee and 57% are familiar with eesti.ee.

The most popular state portal is riigiteataja.ee, which has been used by 44% or around 343,000 Internet users aged from 16 to 74. Every third Internet users has visited the eesti.ee portal and every fourth has used the ametlikudteadaanded.ee portal of official publications.
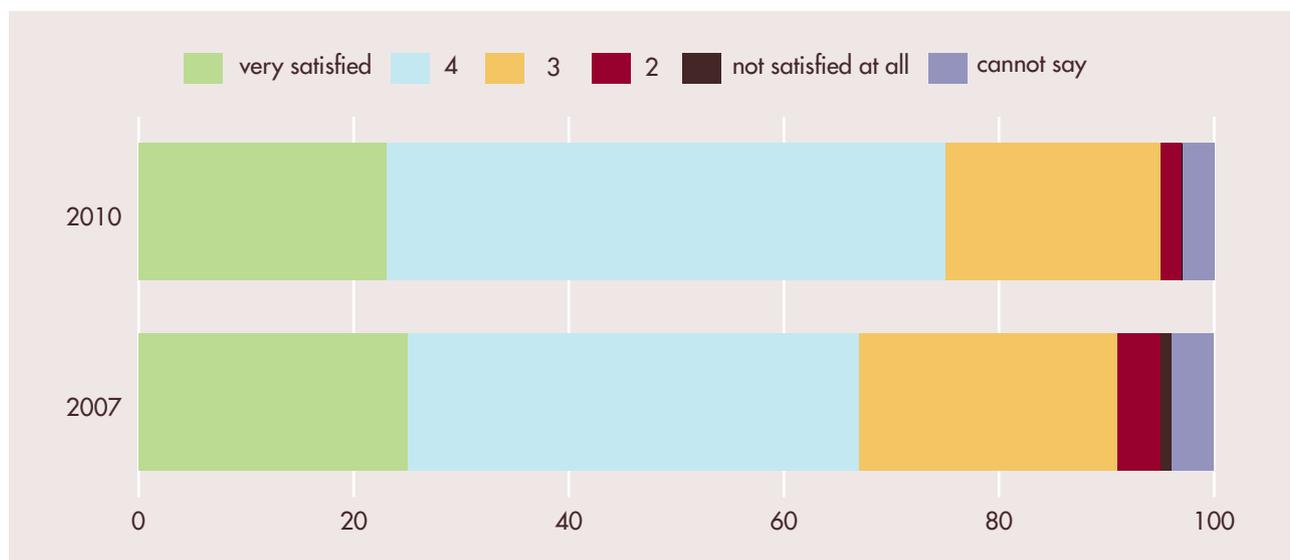
FIGURE 3. General satisfaction with public sector e-services among Estonian residents aged 16–74 (% of e-service users)

Two thirds of eesti.ee users have visited it for information purposes, and 29% have used the e-services of that portal. 22% have visited eesti.ee just to have a look at it. For various reasons, Estonians are far more active users than non-Estonians.

61% of all eesti.ee users have heard that besides information the portal also contains various e-services, such as filling forms, checking one's data in state registers, etc, but they have not yet used any of the services or searched for information. eesti.ee is considered to be a user-friendly portal that contains sufficient information.

The users of e-services were asked about the services they have used in the eesti.ee portal or the data exchange layer X-Road. 44% have not used any of the services of these particular services, and this indicator has not changed since the last survey. Checking one's personal data in state registers has been the most popular service, with every fourth user having used that option (just as many as two years ago). Other popular services include applying for a European health insurance card and checking the results of state exams. Compared to previous years, the share of those who have ordered an electronic polling card has increased. Generally, the use of e-services in the eesti.ee portal or the X-Road environment is considered to be easy.

However, it is necessary to continue with awareness-raising campaigns to introduce the existing e-services, as many residents are not so familiar with them and several services are still waiting to be discovered. Given that satisfaction with e-services is high, the reason for non-use lies in low awareness rather than in the low quality or insufficiency of these services. Therefore, separate campaigns for specific target groups should be organised to raise their awareness of exactly these services that they might need. One of the target groups should be the Russian-speaking population, as their awareness and use of public sector e-services is currently low.

> *Satisfaction with e-services is high. The reason for non-use of e-services lies in low awareness rather than in the low quality or insufficiency of these services.*

2.2.3.
FIRST YEAR OF THE HEALTH INFORMATION SYSTEM

MADIS TIIK
madis.tiik@e-tervis.ee
Estonian eHealth Foundation

The Health Information System is a database belonging to the State Information Systems where the data related to health care are processed for entry into and performance of contracts for the provision of health services, for guaranteeing the quality of health services and the rights of patients, and for the protection of public health, including for maintaining registers concerning the state of health and for the management of health care (subsection 59^1(1) of the Health Services Organisation Act).

On 18 December 2009, the Health Information System celebrated its first year of operation. Currently, health care service providers are obliged to send the following medical records into the Health Information System: image pointer, ambulatory epicrisis, in-patient epicrisis, referral, reply to the referral, notifications of time-critical data, general patient data, notifications of starting and ending a case and recipes. The obligation is currently met by 274 health care institutions, which have sent a total of 500,000 documents into the central system.

However, the concept of eHealth does not denote just the use of computers in health care institutions. It covers also electronic medical records, diagnosis systems, decision support and in the future perhaps also virtual health check.

The Health Information System creates several opportunities for both the patient and the society. For instance, it allows using personal medical info for the treatment of patients or by other agencies to protect the society in the case of risks arising from the patient's health disorders (e.g. upon the issuance of a driver's licence or a firearms licence). More generally, it can be used to promote public health, including devising health and health care policies, managing and controlling the quality of health care and health care services provision and for the purpose of scientific and applied research and statistics.

> *The Health Information System allows using personal medical info for the treatment of patients and, more generally, for promoting public health.*

Interactive services	Citizen's medical record	Information services	Support services
Viewing of prescriptions	Collection of personal health information	Reminders	Administration of rights
Medical record	Self-help	Invitation to screening	Authorisations
eConsultation	Administration of personal data	Making an appointment	Expressions of will
Vaccination passport			Access rights
Virtual health check			Log archive

FIGURE 1. Future services in the Health Information System

The extent to which technology could replace human skills and communication in the treatment process will be a future issue. Health information networks can contribute to data collection and enable access to databases, but also support communication and activities between patients, health care professionals, health care institutions, politicians and regulators.

It is necessary that the information being collected be put to use, so that people would be able to take a more active part in processes related to their health.

The patient's "window" into the health system was opened on 26 October 2009. The patient's portal enables people to see summaries of their case history and medicines prescribed to them or to express the wish to donate organs *post mortem*. In addition, patients are able to appoint a representative who is entitled to buy their prescription medicines and be informed about their medical info. Another function available there is to block a doctor's access to one's health information, but when making this decision, it is important to keep in mind that the doctor may miss out on important information necessary for assigning the most effective treatment. The patient's portal lets people see who have viewed their information and also enquire about the use of their data.

The first stage of the entire eHealth potential has been completed: the different parts of medical treatment systems are integrated and enable doctors to exchange information. However, in longer term it is necessary that the information being collected be put to use, so that people would be able to take a more active part in processes related to their health. Currently, the main focus is on aspects related to treatment, but in the future, the trend should turn more towards maintaining and improving health.

Services provided to citizens by the Health Information System in future:

In 2010, the Estonian eHealth Foundation in 2010 has planned various projects, such as e-ambulance, e-school health, monitoring of data use, a statistics module, further development of the patient's portal, SNOMED NRC – centre of clinical terms, decision support system, preparation of a strategic cooperation model for the introduction of services of the Health Information System, and archiving and integrity control of the logs of the Health information System. International projects include the Regional Telemedicine Forum (RTF), which is a cooperation network devising new telemedicine products, and EpSOS, an agreement of common data exchange between EU Member States, to name a few.

A lot has been talked about the positive impact of the economic crisis on innovation. The need to save both time and money necessitates the need to automate routine activities also in the work of doctors. Taking better care of one's health, raising awareness of one's health condition and the desire to maintain normal lifestyle also in the case of chronic illnesses, which do not, unfortunately, disappear even in welfare states, are growing trends, not to mention the in-

Taking better care of one's health and raising awareness of one's health condition are growing trends.

creasing importance of information technology and paperless records management, which are among the priorities in the development strategy of both Estonia and the EU. To this end, technological instruments are needed. We may have a lot of good ideas on how to achieve that, but we also need the willingness and preparedness of enterprises to come along with these ideas.

The private sector plays a significant role in the development of information and communication technology. Therefore, a support framework could be born out of public-private sector partnership, so as to allow companies to focus on designing applications and investing in them.

2.2.4.
eNOTARY

KAIDI LIPPUS
kaidi.lippus@just.ee
Ministry of Justice

KASPAR KARM
kaspar.karm@just.ee
Centre of Registers and
Information Systems

In the previous yearbook's article "eNotary" we promised to continue with the development of a well-functioning tool for notaries and to introduce new developments in the future.

The last year's most noteworthy eNotary development added a new user-friendly e-service for notary customers. It allows customers to find copies of documents related to them or an institution or company they represent that have been notarised as from 23 November 2009. The documents are retrieved from the high-security eNotary server through the state portal eesti.ee.

The service ensures secure and free access to digital notarised copies. However, it has to be kept in mind that it is possible to find only copies of notarised documents, for instance a sale contract of registered immovable, a contract for the establishment of a mortgage, a share transfer contract of a private limited company, an authorisation document, and other transactions in the case of which the law has prescribed the notarisation requirement. Notarised documents that are not prepared by a notary and where only the signature is authenticated by a notary are not digitally copied and are not available in the State Portal.

The new user-friendly e-service for notary customers allows finding copies of documents.

The copies available in the portal are authenticated by a notary's digital signature, so these are legally equivalent to notarised copies on paper. If the customer has access to a computer, has the habit of using it, and it is known there will be no need to submit the notarial deed on paper, there is practically no need for notarised copies on paper. Naturally, notaries continue to issue paper copies to those who request them.

Customers can use the portal as an archive of their

notarial deeds, where it is easy to find a copy when necessary. Since the archive is permanent, there is no need to save the copies on personal data carriers. The digital archive has several more advantages over a paper database: copies do no disappear, tear, get destroyed, and it is easy to find them by date and other search parameters. They are also easily accessible irrespective of time and customer's location provided the latter has Internet access and secure means of authentication (ID card or Mobile ID).

It is also possible to save digital notarised copies in one's personal computer or to forward them in encrypted form to third persons, that is to the person that authorised a transaction. If a copy is saved in the state portal's environment, other persons can be allocated the right to access it. To do that, the name and personal identification code of the person allowed to see the copy is inserted in the portal. Here it should be kept in mind that notarial documents are confidential and all transaction parties must give their consent to forwarding a copy to third persons.

Copies of documents are easily accessible irrespective of time and customer's location, provided the latter has Internet access and secure means of authentication.

Granting access rights is not a complicated or time consuming process for notaries. After certifying a transaction, the notary prepares a digitally authenticated copy in the eNotary and designates the transaction parties who have the right to access the copy via the X-Road service.

The project was implemented in cooperation between the Chamber of Notaries, Centre of Registers and Information Systems, Estonian Informatics Centre and Ministry of Justice and it was financed by the European Regional Development Fund and Chamber of Notaries.

2.2.5.
DIGITAL USE OF ARCHIVAL RECORDS IN THE NATIONAL ARCHIVES OF ESTONIA: PROGRESS IN 2009

LAURI LEHT
lauri.leht@ra.ee
The National Archives of Estonia

Owing to Estonia's smallness and flexibility but also to the relative compactness and innovativity of the National Archives, the service Estonian archive users receive is among the best in the world. The Internet era has remarkably increased and simplified the use of archival records, and the role of the National Archives in preserving and providing access to our national historic memory and is growing with each year.

Archival Information System (AIS)

The year 2009 saw the end of the ten-year process of entering the titles of archival records in the Archival Information System AIS. The descriptive data of all archiveworthy records complete with the descriptive units of their hierarchies (sub-series, series, archives) of the National Archives of Estonia and Tallinn City Archives, a total of 7.8 million records, are now available.[49] Hundreds of contractual data entry clerks have been involved in entering data in the system, whereas archivists have checked

The year 2009 saw the end of the ten-year process of entering the titles of archival records in the Archival Information System.

the descriptions on the basis of paper directories and, if necessary, prepared modern titles, which describe the contents of records more accurately, to replace outdated descriptions.

The Museum of Estonian Architecture with its 10,000 records was the first museum to join AIS in 2009. The collection and description system of the museum is rather similar to an archive. As agreed, the data of the Estonian History Museum will be added in 2010.

AIS has been available on the Internet since 2004

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49   http://ais.ra.ee

The digitising equipment of Zeutschel microfilms was used to digitise the images of genealogical materials on thousands of microfilms filmed in the 1990s and the first half of 2000s.

and it has radically changed the way Estonian archives are used. It has become much faster to use archival records in the reading rooms, since researchers are able to book materials found on AIS in advance. It used to be necessary to go through pages and pages of paper directories, and it required either specific knowledge or guidance from reading room assistants to know where to search, while now the current text search through titles has increased opportunities immensely. In recent years, people coming to our reading rooms already know exactly which records they want to read. Some funds that used to be rarely referred to due to the inconvenient paper search system are now much more frequently used, as the database provides fluent search results.

Archive users in Estonia are enjoying the best access to archive descriptions – the option of searching the titles of all archival records from an Internet database is unique in Europe. In some Western European countries, the usage of archival records is restricted by a couple of decades long classification, whereas in Estonia it is only necessary to abide by the usual limitations on the usage of personal data. In addition, archives in many European countries receive records from institutions much later than in Estonia, where the period is currently twenty years, and in relation to the emergence of digital documents, it is planned to shorten the time by ten years.

Digitised archival sources

In 2009, the Ministry of the Interior sent to the National Archives all Lutheran and Orthodox church records from 1890s to 1926 (personal records up to 1940), as well as other materials that had so far been kept by the Population Facts Department of the Ministry. Most of the materials had previously been microfilmed, and digitised images from the microfilms were made available to the general public in autumn 2009 in the National Archives' digitised archival sources environment Saaga.[50]

A considerable part of materials needed for genealogical research in Estonia have been published in Saaga since 2005. In recent years, the contents have been supplemented also by other digitised materials (documents of state agencies, maps, etc.) of the National Archives. About one million images were added to the environment in 2009, so by the end of the year Saaga contained 43,372 archival records with 4.4 million images (4.6 terabytes of data in total). The structure of Saaga is relatively simple, receiving the descriptive data of records from AIS and displaying images in a multifunctional viewing programme. Saaga is created and administered by the National Archives' programmers.

The most frequently used materials are those of interest to genealogists, such as church records, personal records, or soul revision lists. It has taken the National Archives only a couple of years to make the majority of such documents available in Saaga, so many Estonians

The option of searching the titles of all archival records from an Internet database is unique in Europe.

50   http://www.ra.ee/dgs/explorer.php

have been able to take up a new hobby and start studying their family trees. The National Archives has, in co-operation with the Estonian Genealogical Society, created a user interface for the entry of data. This is used by voluntary genealogists indexing surnames in personal records. The surnames are used in the name register of Saaga and the indexing simplifies genealogical studies.

A considerable part of materials needed for genealogical research in Estonia have been published in Saaga since 2005.

The fact that the usage of the Archives' reading rooms has declined from 21,000 visits in 2004 to about 13,000 in 2009 can be directly attributed to Saaga. In comparison, 36,500 unique visitors used Saaga 183,000 times in 2009. There are between 100–200 users logged in at any point in time.

In 2009 the National Archives received an award in the national competition "Best web content service 2009" within the framework of the international competition World Summit Award (WSA) for Saaga as the best application of e-culture and heritage in Estonia. The award was presented at the information society conference "Tark mees taskus" (in English "A Wise Man in the Pocket") held on 17 February 2009.

Whereas so far the National Archives have been digitising materials under their own steam and at an average speed, in 2009 the Ministry of Economic Affairs and Communications accepted five preliminary applications for grants funded by the EU structural funds. The grants are intended for the digitisation of archival records and for publishing them within the framework of one of the priority objectives of the economic environment operational programme, "Development of information society":

1. Digitisation of the photo negatives, and diapositives of the National Archives. Digitisation of 415,500 photos, which are mostly from the Estonian Film Archives but also from the National Archives and the Historical Archives.
2. Digitisation of and creation of online access to the Estonian oldest cultural heritage (parchment collections of the National Archives, Tallinn City Archives, and the Estonian History Museum). A total of 4,122 parchments will be digitised (1,581 in the Historical Archives, 2,148 in the Tallinn City Archives and 393 in the Estonian History Museum).
3. Digitisation the maps and designs of the National Archives. This includes the digitisation of a total of 19,700 maps and designs in the Historical Archives and National Archives.
4. Digitisation of nitro based chronicles in the Film Archives. 30 hours of unpublished movie material from 1920s to 1950 recorded on inflammable nitro film will be digitised.
5. Digitisation of both originals videos and copies of

movies of the Film Archives. A total of 700 hours of video material will be digitised.

The cost of the five projects amounts to 24 million kroons. The work will start in spring 2010 and last 12–24 months.

Virtual reading room VAU

In spring 2009, the National Archives opened a virtual reading room VAU.[51] This web application is an umbrella portal centralising all the web services of the National Archives and creating archive users a common access point to various web services and applications, which had earlier tended to be somewhat scattered. In addition, current applications were enhanced by new possibilities:

- establishment of personal databases integrated with Saaga and the possibility of making the database available to other users
- link notebook integrated with Saaga for bookmarking links to archival records
- user forum integrated with Saaga
- online store for the acquisition of publications of the National Archives
- system of posting queries to receive archival notifications
- better technical organisation of user feedback and questions

Like Saaga, VAU is also available in two languages, Estonian and English, which gives global dimensions to users of the Estonian archives.

Development of digital archives software

The year 2009 saw the continuation of intensive work on the creation of digital archives software enabling the receipt, maintenance and usage of the archive of digital documents.

According to the investment plan of the priority field "Development of information society" established by the Government of the Republic Order No 203 of 28 May 2009 "Operational programme for the development of economic environment", the National Archives' information system for the receipt of digital archival records was allocated investment resources in the amount of 7 million kroons. The project will last 18 months.

In 2009, five preliminary applications for grants for the digitisation of archival records were approved.

The most important development here will be the development of the digital archives receipt module. To this end, a public procurement was organised within the framework agreement and in September a contract on the creation of the receipt module was concluded with AS Tieto Estonia. They will adjust the software Tessella Safety Deposit

51 http://www.ra.ee/vau/index.php?page=ArchiveMainPage

er electronic records management systems: additional programming will not be necessary, one-off description of the compliance of EDMS output data with the input XML-schema in the UAM converter will be enough. The first simplified interfacing was made in cooperation with the State Chancellery and it lies in the possibility of exporting data from UAM EDMS to the State Chancellery's EDMS GoPro.

In 2010, the Bureau of Digital Preservation of the National Archives will be technically ready to receive digital documents from other institutions' EDMSes according to correct digital preservation principles and procedures. The creation of a system for the functionality of long-term preservation of digital archival records and for ensuring access to digital archives has been planned for 2011–2012.

A logo of the National Archives dating back to the beginning of the 20th century and depicting an archivist who is using all his strength to transport records. Today, Saaga provides 24-hour access to archival records and no physical browsing is necessary.

Box 4 (SDB4) to the needs of the National Archives. Tessella SDB software has been created by the British software company Tessella for the British National Archives and the main users of its recent version SDB3 are the national archives of the United Kingdom, Switzerland, Malaysia, the Netherlands, and the USA, the Austrian public sector digital archives, the British Library and the Wellcome Library. The decision to partly use readymade software

The National Archives will be technically ready to receive digital documents in 2010.

was due to the desire to involve knowledge and experience from countries boasting years of competent digital archiving history and to have a say in the creation of global know-how.

In addition, the universal archiving module (UAM) will be developed further. The UAM software created in 2008 will be enhanced on the basis of feedback received from users and EDMS developers and it will be supplemented by several new functions. The most important one will make it easier to interface UAM with oth-

2.2.6.
INFORMATION TECHNOLOGICAL DEVELOPMENTS IN THE ROAD ADMINISTRATION IN 2009

ALDO TATTER
aldo.tatter@ark.ee
Estonian Road Administration

The year 2009 was the year of changes and development for the Road Administration. The most important organisational development was joining the Motor Vehicle Registration Centre and the Road Administration into a single authority, the Estonian Road Administration (ERA) on 1 July 2009. This means two important national registers, the Traffic Register and the Road Register, are now in one institution. But there is even more to come. As from January 2009, the Road Administration has a new function – organisation of public transport in Estonia. This means the authority is in charge of a third national register, the Public Transport Register.

Speaking of the Traffic Register, development of its new information system, which lasted for two years, has come to an end. The current Traffic Register information system software is from 1999, so it is high time to launch a new system. The introduction of the new information system has been delayed by a couple of months, but a system of such large volume needs proper testing and code debugging, so it will be launched in full capacity in the first half of 2010. The update includes a new database structure, a customer service programme for the registers of driver's licence, licence for operating recreational craft and recreational craft, a new programme for driving theory and practical driving state exams, and a programme regarding technical inspection. The e-services of the traffic register will also be updated and all interfaces with other institutions and information systems will be transferred to the data exchange layer X-Road.

As regards the Road Register, the main focus is on the specification of the spatial figures of local roads in

Innovations and developments in the information systems of the Traffic Register and the Road Register.

cooperation with the Estonian Land Board. A new web-based programme has been designed to administer this information. Further developments concentrate on the arrangement of data on local and forest roads. All this will later be published as a map layer, just at it was done with national roads some years ago.

As said before, the Public Transport Register is a new information system for the Road Administration. Up to now, the management and development of public transport was the responsibility of the Ministry of Economic Affairs and Communications, which also initiated development of the new Public Transport Information System (PTIS). The first stage of the new system has been completed and it consists of the information system for the development and coordination of public transport lines and timetables, and the information and coordination system. In addition, a trip planner intended for the general public has been completed.[52] The development of the project will continue also in 2010, and the current activities are mostly related to generating a national bus tickets sales system. The development of the PTIS is funded by Iceland, Lichtenstein and Norway through the EEA and Norwegian financial mechanisms.

The most relevant news to the general public is the adoption of the speed cameras information system.

In addition to national registers, the Estonian Road Administration has several other important information systems. The largest and most relevant to the general public is the database and information system of stationary automatic speed measuring system, that is the speed cameras information system, that was launched in full capacity in 2009. By November, the necessary support infrastructure had been created, all the cameras on Tallinn-Tartu road had been installed, data transmission channels had been tested and the necessary personnel training had also been carried out. This means, all registered speed limit violations are also saved since November. The fining of speed limit violators will start after the launch of the caution procedure information system by the Police and Border Guard Board.

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52 http://www.peatus.ee/#route_search/eng

2.2.7.
NATIONAL PUBLIC TRANSPORT TRIP PLANNER PEATUS.EE

OLARI TAMMEL
olari.tammel@mnt.ee
Estonian Road Administration

The development of the Public Transport Information System (PTIS) consists of four stages. The first stage set out the design of the information system for the preparation and coordination of public transport lines and timetables intended for public transport organisers and carriers (abbreviated as PIKAS in Estonian) and the information and coordination system (abbreviated as TKIS in Estonian).

In the second stage of the project, the trip planning portal peatus.ee for users of public transport was completed. It helps find public transport connections between departure and arrival points chosen by the user. The portal assists public transport users in planning their travel, be it by bus, trolleybus, streetcar, boat, plane, train or all of them together. The system contains the timetables of all county bus lines, long-distance coaches, international coaches and buses of Tallinn, Tartu, Pärnu, Rakvere and Viljandi. In addition, peatus.ee includes information on ferries, domestic flights and trains. One of the future development goals regarding the portal is to include the timetables of the rest of town and rural municipality bus lines.

All information about buses, streetcars, trains, boats and plains from one place.

So far, similar systems have been city-based or service provider-based, but peatus.ee is unique in that it provides all public transport information in one place. One of the reasons why the information system was generated was the objective of contributing to the goals established in the national "Transport development plan 2006–2013" by increasing the popularity of public transport.

Peatus.ee is a neat compromise between user friendliness and functional versatility, offering its users as detailed information as possible without requiring too many actions. For instance, if you enter "Viru" in Tallinn as the Start stop and Kilingi-Nõmme as the End stop, you will get a detailed description of the route – when the tram from the Viru stop for the Bus Terminal departs, how many minutes it takes to walk from one stop to another, which coach takes you to Pärnu and from there to Kilingi-Nõmme. In addition, the portal calculates the time it takes to pass the entire route and offers the possibility of e-mailing your travel plan to your friend. When conducting the route search, users are able to set additional conditions, for example, to determine the maximum walking distance, specify the means of transport they want to use, etc.

In order to increase user-friendliness, peatus.ee is interfaced with the Central Address Data Management System (ADS System) prepared by the Land Board. The system provides peatus.ee with address services. As a result, it is possible to find public transport solutions by entering addresses of departure or arrival points. Using the coordinates of the address entered by the user, peatus.ee finds the closest public transport stops and the fastest connections.

It is possible to search for a route by selecting two random points on the map. Similarly to the address search, the system uses coordinates to find the closest stops and fastest connections. In addition, the desired search results may be displayed on a map and also printed out.

User-friendliness. Notification by e-mail.

Since public transport timetables are constantly changing, users of peatus.ee can use the notification service: if a timetable they use is changed in the database, they will receive an e-mail informing them about the changes and showing a link to the address where the new timetable is available.

On 28 September 2009, a nationwide advertising campaign promoting peatus.ee was launched. As a result, the portal received an average of 5,000 visitors a day. After the end of the campaign, peatus.ee is visited by about 1,500 people a day on weekdays and by 2,000 people at weekends.

Registered users of the portal are also able to give feedback to the administrators of the portal. This may be of use if they notice deviations from actual timetables or find faults in the system damaging the ease of use. All the feedback received so far has deserved due consideration and the system has been noticeably improved. The toughest challenge for the portal development team and the Land Board has been the describing of reasonable search algorithms to enable users to plan their trips in both urban and rural areas.

The cost of development of the peatus.ee trip planner was 2.3 million kroons. 77% of the funding comes from the EEA and Norwegian financial mechanisms. The system is developed by a consortium of AS Cybernetica, Affecto Estonia OÜ and EOMap Geodata AS.

The next stage of the PTIS is the development of a ticket sales information system. This means peatus.ee will start to include information on public transport ticket prices in Estonia.

III

Development of knowledge-based economy

3.1. Promotion of ICT uptake in enterprises

3.1.1.
IN THE ROAD MAPS OF THE ESTONIAN DEVELOPMENT FUND – THE NEW COMING OF THE TIGER

KRISTJAN REBANE
kristjan.rebane@arengufond.ee
Estonian Development Fund

In Estonia, the metaphor of the tiger in the context of education and information and communication technologies (ICT) does not require further explanation, as it refers to more widespread use of IT in general education and schools. However, lately there have been complaints that the tiger has fallen asleep. Are we in need of new impetus?

Although several studies (TIMMS 2003, PISA 2006, TALIS 2009[53]) show that education provided in Estonia (its results, extent and purposefulness) is very good by international standards, our children consider learning uninteresting and assess their performance as low, especially in sciences. In addition, our demographic situation makes us choose whether we are able and willing to continue like this or whether we could make use of technology to ensure that affordable high-quality education reaches every child. This leads to the question if we have potential to preserve and further develop the image of an IT-oriented state – the ambitious goal set out in various development plans,

Could the use of technology ensure that affordable high-quality education reaches every child?

for instance the Estonian RD&I strategy for 2007–2013 "Knowledge-based Estonia".

In spring 2008, the Estonian Development Fund launched the EST_IT@2018 foresight with the objective of identifying the areas in which information and communication technologies could contribute the most to the development of Estonia's economy and society over the next ten years. By the end of the first stage of EST_IT@2018, six target areas were identified, where IT application will contribute the most to both welfare growth and economic expansion by extending export possibilities. These are education, health care, manufacturing, energy, financial services and ICT security systems. Each of them has specific challenges and opportunities for the implementation of IT. However, to start with, it is necessary to agree on the overall aim and to contribute to finding a "smart contracting entity" to implement the vision. Therefore, it was clear that in addition to drawing general conclusions from the foresight exercise, it is imperative to delve deeper into these areas.

The EST_IT@2018 foresight aims to identify the areas in which ICT could best contribute to the development of Estonia's economy and society.

With the objective of determining the key concerns in education in Estonia and of establishing IT solutions to these concerns, the Development Fund initiated the development of roadmaps in the six areas. Specialists and experts in each area identified the opportunities for development in their field and set targets to reach their goals. The ICT roadmap of education was the first one completed at the beginning of 2010. The following is a brief overview of the conclusions reached by the broad-based expert group (from the Ministry of Education and Research, Estonian Information Technology Foundation, Archimedes Foundation, Tiger Leap Foundation, ICT companies, eLearning specialists from higher education institutions, and teachers).

The development of roadmaps was initiated to determine the key concerns in education in Estonia and to find IT solutions to these concerns.

The group came up with four scenarios regarding the development paths of education in Estonia. These

53   TIMMS (2003), Highlights from the Trends in International Mathematics and Science Study,
http://nces.ed.gov/pubs2005/2005005.pdf
PISA (2006), Programme for International Student Assessment,
http://www.pisa.oecd.org/
TALIS (2009), Teaching and Learning International Survey. First Results from TALIS, http://www.oecd.org/edu/talis/firstresults

differ from each other as to the role and policies of the state in shaping education and as to values dominating the society. The most preferred vision scenario was "The Nordic Tiger", which is characterised by education policy with a long-term vision and the prevalence of such values at schools and in the society as a whole that support tolerance and appreciate individual differences. If the scenario materialises, by 2018 there will be ICT skills, support system and materials in place in general education that support education which is interdisciplinary, modern and considers individual needs, as well as greater interest in learning nature-related subjects and science. If we want to see education like that in less then ten years, the key question lies in what and which decisions will have to be taken immediately to start moving in the right direction. As we all know, most of changes and developments in the field of education take quite a long time, which means it is necessary to take time to achieve goals set for the future. Each day lost will postpone reaching the goal.

As a result of analyses and discussions, the following educational key problems that ICT can help alleviate were pinpointed:

- shortness of students' interest in and skills of learning (especially as regards natural and exact sciences) and
- insufficient skills and readiness of teachers to use ICT and weakness of the necessary support systems.

How to tackle these challenges? It is obvious that equipping schools with technology and software is not enough. What matters is how ICT tools are used and which resources are made available to support learning.

Electronic interactive study aids, and teachers and pupils who have the skills and desire to use ICT.

This is where the roadmap becomes of help, showing how to reach the vision and which milestones are interconnected. The tools steering us towards "The Nordic Tiger" include electronic interactive study aids that consider individual needs for each grade, new assessment methods that make use of ICT, teachers who have the skills and desire to use ICT in their work and pupils whose interest in learning will increase, since learning will have become more deliberative, playful and individual. One idea is to establish an innovation foundation in support of creative (pilot) projects to generate learning methods and materials using innovative and ICT tools.

Looking at all the good intentions it is important to know what should be done first to start moving in the desired direction and find ourselves where we wish to be in ten years. There is a dire need for a renowned leader who would keep an eye on the "big picture" and manage single specific actions. This does not necessarily have to be a new institution, if any of the existing ones is willing and able to do the work. The focus will probably be on teaching-related activities, since the IT infrastructure in the field of education is apparently not the factor to inhibit developments.

School-related people have themselves admitted the need for more support and training in areas teaching how to make the most of ICT. This concerns teaching (methods), learning (study aids and sources) and also administration (support systems such as e-school). There is an obvious need for the training of teachers and also educational technologists at schools to provide daily methodological and technical support (such jobs have already been created at vocational and higher-education schools). Taking into use of study and aid materials in electronic form will not be easy, either. Technology is not an obstacle here – we spoke about electronic workbooks ten years ago. Rather, challenges lie in restructuring the existing system so that it would generate a sustainable (business) model that motivates authors and publishers and satisfies the needs of users.

The critical success factor is to start with primary activities already now, in 2010, or otherwise all future developments will be delayed. Good luck to all of us in this endeavour!

3.1.2.
ELECTRONIC REPORTING – BENEFICIAL TO ALL PARTIES

KADRI-CATRE KASAK
kadri-catre.kasak@just.ee
Ministry of Justice

Since 1 January 2010, it is possible to submit annual report data to the Central Commercial Register and the Register of Non-Profit Associations and Foundations (hereinafter commonly referred to as *the register*) only electronically.

In order to simplify the organisation of reporting, it was decided to establish a government committee including members from different agencies: the Ministry of Justice, Ministry of Finance, Statistics Estonia, Eesti Pank, Centre of Registers and Information Systems, Estonian Chamber of Commerce and Industry, Ministry of Economic Affairs and Communications, Ministry of Social Affairs, Ministry of Agriculture, and the Tax and Customs Board. The Estonian Board of Auditors and the Accounting Standards Board are represented too.[54]

Respondent and user-friendly reporting

The existing organisation of reporting burdens both those submitting data and the state. Reporting entities report on their activities and economic indicators to several institutions, for example to registration departments of county courts, to the Tax and Customs Board and to Statistics Estonia. Reports are collected either on paper or electronically and it takes a lot of resources from the state to process the data and enter them into databases.

The purpose of the project is to simplify reporting so that reporting entities could submit the indicators required by the state in an agreed format in one go and at one place, and so that both the private sector and state agencies would be able to use the data, in accordance with the rights given to them.

The automatic check signals possible errors to users already when data are being entered. This contributes to the quality of data and decreases the amount of warnings and fines that reporting entities get for shortcomings in their reports.

The submitted data are more comparable and allow more accurate economic analysis. In addition, electronic data can be accessed much faster and the processing of data to make it digital will no longer be so time-consuming.

International standard

It is reasonable to follow a common standard in international information exchange, since unification of reporting indicators allows to interpret them in the same way. The XBLR standard (eXtensible Business Reporting Language) is becoming increasingly more popular in the world. Introduction of the standard has taken off in Sweden, Denmark, the Netherlands, Italy, England, Belgium, and now also in Estonia.

XBRL is an XML-based platform for data exchange, which is well suited for faster, more efficient and cheaper exchange, processing and analysing of business and financial data. XBRL is developed by XBRL International, a non-profit consortium of about 250 enterprises, organisations and governmental authorities. It is an open global standard that does not charge licence or other fees from its users.

One of the most important things is to agree on a central taxonomy for the annual report and approve it at national level. The taxonomy is a list of items (complete with linkbases), where each indicator (data item) is allocated its own tag, which will later enable the computer to process data easily and quickly. In Estonia, the regulation on the taxonomy of the annual report, which specifies, among other things, the list of items for companies, non-profit associations and foundations, entered into force on 1 January 2010. Since 1 January 2010, reporting entities and their auditors are able to use an online reporting environment to prepare a report, check it, sign it, add the sworn auditor's report and send it to the register. There are the mandatory parts of the report (main reports) and parts that reporting entities can, according to need and obligations deriving from the Accounting Act, add to the report or fill out in the report (annexes, including possible prescribed format structures, supplementary texts). The environment also assists the reporting entity and the auditor by providing summation and review formulas to check whether different parts of the report are in compliance, and explanations, references and help information.

Simplification of reporting so that reporting entities could submit the indicators required by the state in an agreed format in one go and at one place.

Stage-by-stage transition

Changes in the submission of reports concern all companies that are subject to submission of their annual report to the Commercial Register, non-profit associations (including parties, trade unions and apartment associations) and foundations. The project does not concern le-

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54 Information on the work of the committee is available at http://ajaveeb.just.ee/e-aruandlus/ (in Estonian only)

gal persons governed by public law (the state, accounting entities of the state, local governments, other legal persons governed by public law), self-employed persons and branches of foreign companies.

Since devising the taxonomy of the annual report takes a lot of efforts, the project is divided into stages. In its first stage starting from 1 January 2010, the project addresses companies, non-profit associations and foundations, which prepare their unconsolidated financial statements on the basis of accounting principles generally accepted in Estonia, and must therefore follow the taxonomy, and prepare and submit the report in the reporting environment.

Changes concern companies, non-profit associations and foundations.

For the time being, PDF reports must be submitted by: 1) IFRS users, 2) those who submit consolidated reports, 3) companies, foundations and non-profit associations that submit their reports to the balance records of the Ministry of Finance, 4) those who submit liquidation and final reports, 5) accounting entities whose principal and permanent activity is, for the purpose of the Credit Institutions Act, provision of financial services. The second stage of the project will find solutions for them as well. For reporting entities submitting balance records, an application will be designed for data exchange between the Ministry of Finance and the Commercial Register.

Entering the reporting environment

Management board members who have the authentication tool for digital signing and who have been entered in the register with their personal identification code can digitally sign the report in the reporting environment (supervisory board members no longer have to sign the annual report). It is also possible to enter the environment using the authentication service of a commercial bank, but then it is impossible to give a digital signature to the report. However, it is allowed to create a PDF of the electronic report, which can be printed out, signed on paper and then added to the environment. This is the way to behave in the case of legal persons, when not all management board members are able to give a digital signature in the reporting environment.

The new reporting format is simple and easy to use.

Management board members with authentication tools that allow digital signing and also members that log in through an Internet bank and that have been signed up on the register with their personal identification code and can thus be related to the company, can use the portal to give authorisation to, for instance, the accountant to prepare and submit the report. However,

if management board members have been signed up on the register with their date of birth, they are unable to give authorisation to prepare and submit reports, since it is impossible to relate them to their company when they enter the environment. In this case, the only way to give authorisation is to go to a notary.

It is also possible for such management board members to submit the report themselves, by finding the right enterprise from the register according to the company's business name or registry code. Another way of preparing and submitting the report is to have somebody else do it, usually the company's accountant. This person has to log in by using authentication tools, find the respective reporting entity and prepare the report in the environment. In addition to the report prepared by the accountant in the environment it is also necessary to upload a PDF report prepared and signed by the management board.

The described authentication rules apply also to reporting entities that do not prepare their report in the reporting environment, but submit the report in PDF instead.

Enabling access to the auditor

A person authorised to represent the reporting entity, such as member of the management board, can appoint an auditor in the reporting environment to audit the company's annual accounts. This is possible only if the person appointing the auditor is signed up on the register with the personal identification code. If the annual report is digitally signed in the environment, the auditor's report must also be digitally signed. To this end, the person authorised to represent the reporting entity must allow the auditor to access the report prepared in the electronic environment and the auditor must accept the permission. If the annual report is submitted in PDF, the auditor's report may also be signed on paper.

Preparing the report – easy or complicated?

The new reporting format is simple and easy to use for preparing and submitting electronic reports. The process will be even easier in the future, because reference data will be displayed in relevant fields, which will make the preparation of the report even faster and more convenient.

If a reporting entity does not want to prepare and submit the annual report in the reporting environment and if the entity's financial year started on 1 January 2009, it is possible to submit the report through a notary in 2010. This option is available for those who have to follow the taxonomy and also for those who do not. The notary enters the report in the register in PDF.

Hopefully, software producers will soon start offering accounting programme modules for electronic submission of data to the register. This would allow sending data to the register with just one click on the button.

3.1.3.
PREPARATIONS FOR PROCESSING DIGITAL INVOICES

HANNES LINNO
hannes.linno@ria.ee
Estonian Informatics Centre

By the beginning of 2009, the introduction of the Document Exchange Centre (DEC) in the public sector had been completed. By that time, all records management systems in the public sector were capable of processing digital records. Full transition to digital records management requires also verified flows of digital records between the private and the public sector.

The most common type of records exchanged between state agencies and companies is invoices. Therefore, the function of forwarding and processing invoices is the first to be implemented. Furthermore, eInvoicing produces the greatest economic effect compared to other types of records.

In 2005, an XML-format for eInvoicing was developed on the initiative of the Estonian Banking Association, which enables to compile machine-readable sales invoices. Electronic invoices are always sent in XML and also PDF format to provide a human-readable view. Systems draw data from XML invoices, while people can use PDF files. The sender of the invoice is responsible for the identical content of PDF and XML invoices. By 2009, the Banking Association's support to XML standard for eInvoicing had been introduced in a number of private sector systems, whereas the public sector was still not ready for the receipt and processing of electronic invoices in XML format.

eInvoicing produces great economic effect.

In the first half of 2009, the Estonian Informatics Centre launched a project for establishing a technological environment for eInvoicing. The project is funded from EU structural funds and will be completed by December 2010.

The project draws on the principle that records management must be automated and as easy as possible, while complying with daily work processes. Therefore, the processing and circulation of electronic invoices will be implemented in existing records management systems and accounting systems.

The eInvoicing project sets out to provide major records management systems with the functions of drawing and displaying data from XML format and processing electronic invoices. Processing includes giving approval to the incoming invoices by authorising officers and the distribution of the amounts invoiced by cost managers between different dimensions (projects, areas or departments). Once an invoice has been approved in the records management system, the accountant can verify or correct the data on the invoice and submit payment information automatically to the accounting system. It is no longer necessary to manually move data from one system to another or print out invoices, as archiving can be performed in a records management system, which files also other records.

The eInvoicing project also aims to implement the function of sending and receiving invoices through the Document Exchange Centre, and the function of receipt and submission for payment of electronic invoices processed in records management systems. In other words, accountants only need to check and verify the data of processed invoices, which is then followed by payment.

The processing and circulation of electronic invoices will be implemented in existing records management systems and accounting systems.

DEC interfacing is one of the key components in the eInvoicing project, while it ensures a secure flow of electronic invoices to the recipient systems.

The technical solution for eInvoicing is modular and each agency can decide whether to channel the flow of incoming invoices first to an accounting system where they are corrected and then submitted for processing, or to a records management system to be processed and forwarded to an accounting system.

3.1.4.
WEB-BASED PUBLIC PROCUREMENT

MAARIKA TORK
maarika.tork@fin.ee
Ministry of Financial Affairs

In 2009, the Ministry of Financial Affairs initiated a project of establishing a web environment for eProcurement. The eProcurement web environment will be completed by the end of 2010, providing an innovative tool for contracting authorities and tenderers for organising and participating in electronic public procurement. The system will allow to make electronic tenders, to develop dynamic procurement systems, and to hold electronic auctions. In addition, a central website will be launched, which will include guidelines for public procurement.

eProcurement: a part of the eEurope initiative

The development of eProcurement to facilitate public and private sector cooperation has been a priority among EU initiatives since 2004, when the procurement directives 2004/18/EC and 2004/17/EC entered into force. These directives laid the foundation for a single framework for organising public, transparent and non-discriminative electronic procurement in Europe. In addition, the directives set out the rules for submission of electronic tenders and participation in public procurement and for the use of advanced electronic tools. A large-scale uptake of electronic public procurement allows to save up to 5 per cent of the total cost of public procurement. Parties to proceedings can save at least 10 per cent. The Member States of the European Union have set the goal to make all public procurement electronically available in 2010, which will lead to an expected increase of 50 per cent in the use of public procurement.

The advantages of eProcurement

The most significant aspect in developing web-based public procurement is the transparency of the procurement process and fair selection of the winning tenderer. Assisting procurement participants with the rules for procurement is similarly important. Transition to electronic procurement has several advantages:

- increased transparency of public procurement
- a drain on time and resources both for contracting authorities and tenderers

- faster procurement processes
- easier enforcement of the Public Procurement Act
- better awareness of the organisation of public procurement
- environmentally sound procurement
- better opportunities for competition for small and medium-sized enterprises
- better access to cross-border markets.

As the provisions concerning public procurement draw on paper records management, electronic tools help to simplify the procurement procedure. Progress depends on the extent to which traditional procurement methods will be shaped into electronic services. This requires rethinking the service and reshaping various processes. The reshaping and standardisation of tender documents, and the uptake of harmonised formats allows to automate some routine procurement operations which means that both parties can better concentrate on the content of procurement.

Estonia's eProcurement system

Web-based public procurement involves three primary phases before a public procurement contract is concluded: electronic notification, electronic submission of tenders and applications, and operations in an electronic environment for identifying the winning tenderer. The first phase, electronic notification of procurements and contracts, was introduced in Estonia in 2001.

Estonia was one of the first EU countries to start publishing contract notices and public procurement reports electronically. The register gathers and processes public procurement data, and submits notices on procurements that exceed international marginal rates to be published in the Official Journal of the European Union. One important component of eNotification is the status of e-sender, which was assigned to the register in November 2009 and which allows to send contract notices

Electronic notification, electronic submission of tenders and applications, and operations in an electronic environment for identifying the winning tenderer.

to the Official Journal of the European Union automatically in XML format instead of PDF format used earlier. The contract notices of Estonian contracting authorities are sent in a structured format to the European Tenders Electronic Daily within five days, instead of the previous twelve days. As a result of the developments made in 2009, it is now also possible to upload and download contract documents electronically. Before downloading, the interested persons are registered to particular procurements. The register allows contracting authorities to keep a list of interested persons to send them notifications and additional documents, including the report on the opening of the tenders.

The year 2010 will witness several developments in electronic public procurement. Contracting authorities and tenderers will be able to use existing document templates to prepare contract documents, to add necessary documents, and to send procurement notices to be published in the register. Tenderers will be able to submit digitally signed tenders and applications through a web environment. Contracting authorities will have access to submitted tenders and applications after the specified closing date, which helps ensure their integrity and confidentiality. Contracting authorities will no longer need to hold special meetings for the opening and evaluation of tenders, as members of the evaluation committee can use the Internet for that purpose, regardless of their geographical location. Tenderers will be able to monitor the opening of tenders and applications in real time.

> *Tenderers will be able to monitor the opening of tenders and applications in real time.*

The public procurement web will be an environment for exchanging data on procurements between contracting authorities and tenderers. Once the tenders and applications have been opened and a report has been drawn automatically, the contracting authorities will be easily able to check on the absence of the bases of elimination from the procurement procedure and on compliance with the qualification requirements by making queries over the data exchange layer X-Road to other registers. In addition, it will be possible to hold an electronic auction in the last phase of tender evaluation to identify the winning tenderer. Another development will be the establishment of a dynamic procurement system to allow multi-level procurement with the duration of up to four years, which is used for contracting non-specific products like stationery. The dynamic procurement system is similar to framework contracts, but differs in that tenderers can join the system throughout its operating life.

> *The eProcurement environment and the existing public procurement register will be operating jointly.*

The eProcurement environment and the existing public procurement register will be operating jointly. Guidelines and instructions will be available on the central website of these two applications. The website will also allow notification of procurements with a value less than the threshold of public procurement.

Possible barriers

The implementation of eProcurement entails several problems and legal, technical and organisational barriers that pose a great challenge for policy-makers. Diversity and incompatibility of technical solutions can render suppliers' access to e-procurement systems impossible or discourage their participation because of additional difficulties or increased costs. The use of digital signatures can create problems with cross-border tenders. The new Procurement Directives do not define which type of e-signature should be used in electronic tendering. Thus Member States, who have different legal signature concepts, may choose the level they require in conformity with the e-signatures Directive 1999/93/EC. However, the Directives oblige any public purchaser in the EU to effectively recognize, receive and process tenders submitted, if required, with a qualified signature and their accompanying certificates, regardless of their origin within the EU or their technical characteristics.

Progress depends on joint efforts

Moving public sector procurement online requires legal, institutional and organisational changes at many levels, offering both opportunities and challenges. Joint efforts are needed from contracting authorities and tenderers to develop the eProcurement environment and to achieve the ambitious goal of making 50% of the procurements online. To this end, the Ministry of Financial Affairs is ready to assist all future eProcurement participants with the electronic and legal environment of eProcurement. At the EU level, several issues are still to be resolved, like cross-border digital signing, electronic certificates and electronic catalogues, to name a few.

3.1.5.
POINT OF SINGLE CONTACT

ANDRES RUUBAS
andres.ruubas@mkm.ee
Ministry of Economic Affairs and Communications

The EU Services Directive Implementation Act sets out points of single contact for service providers to complete any necessary procedures in order to provide their services.

Points of single contact have been set up in each Member State to provide information and easy access to administrative operations at work or at home. The start-up or expansion of a business no longer requires dealing with formalities with a number of different stage agencies, such as the commercial register, the competent authority, the local authority or professional bodies at the state and local levels. Instead, all formalities can be done through the single contact point, which:

Points of single contact allow service providers to complete any procedures necessary to provide their services.

- can be accessed in the Internet
- provides clear and comprehensive information about the administrative operations and special requirements
- allows to perform the necessary administrative operations electronically
- allows to submit the required data and documents
- allows to receive the decisions, licences and other information electronically

Example: *An Estonian construction company wants to start up a business in Sweden. The manager of the company can go to Sweden's single contact point to find the terms and conditions for launching a subsidiary in Sweden. He then submits all the required documents and applications electronically through that single contact point, and also receives decisions, licences and other necessary things through that point. The same procedure applies to, for instance, an Estonian company wishing to set up a subsidiary in its home country. All the required information and documents can be submitted and received via the Estonian point of single contact.*

In Estonia, a sub-portal will be established under the state portal eesti.ee, which will allow entrepreneurs to submit their documents and applications and to receive information concerning the provision of services fall-ing under the scope of the law. The sub-portal offers information about the general interpretation of the terms and conditions of service provision, and if required, also advice and basic instructions on how to comply with the requirements for service provision. In addition, the point of single contact allows queries regarding the terms and conditions of offering services in other EU Member States. In order to reply to these queries, the competent authority of the other EU country is contacted.

The point of single contact will be implemented as a sub-portal for entrepreneurs under the state portal eesti.ee.

The European Commission has set up a central portal at http://ec.europa.eu/eu-go that includes the points of single contact of all Member States.

Estonian and other EU service providers can submit required applications, data and documents electronically through the point of single contact. However, it is also possible to submit paper documents directly to the competent authority without using the point of single contact.

It is not allowed to require originals from the service providers, neither as certified copies or translations, unless provided otherwise in EU regulations or unless there is a significant public interest. All doubts regarding the authenticity of documents are resolved through administrative cooperation between the Member States. Competent authorities may require the submission of documents in the Estonian language.

To avoid duplicate data requests, it is not allowed to require information from service providers that is already available in the Commercial Register, the Register of Economic Activities or any other state database.

The set-up of a point of single contact in Estonia

The main responsibility for setting up Estonia's point of single contact in the State Portal eesti.ee lies with the Estonian Informatics Centre. The set-up project involves also the Register of Economic Activities under the Ministry of Economic Affairs and Communications and the Centre of Registers and Information Systems under the Ministry of Justice. These three state agencies were allocated a total of 12 million kroons from the structural funds, of which the Estonian Informatics Centre received a half.

It is not allowed to require information from service providers that is already available in some state database to avoid duplicate data requests.

The project must be completed by October 2010, when the Estonian point of single contact will be established under the State Portal,
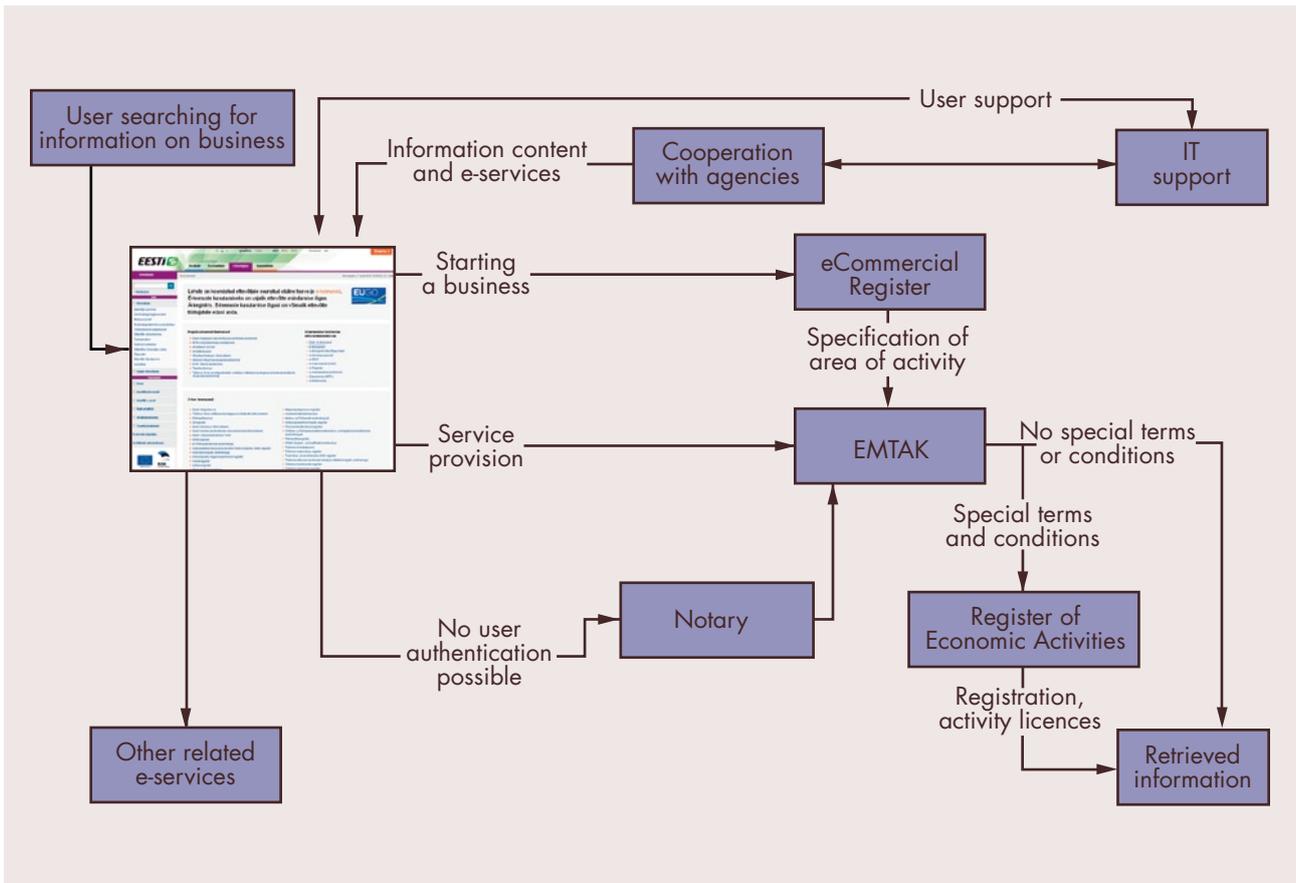
FIGURE 1. Finding information and using services related to access to an area of activity

which will include interfaces to the eCommercial register, the Register of Economic Activities, and the information system of the Statistical Classification of Economic Activities in Estonia (EMTAK). The entrepreneur's view of the portal is available at:

- http://www.eesti.ee/est/ettevõtja (in Estonian) and
- http://www.eesti.ee/eng/business (in English)

Figure 1 illustrates finding information and using services related to access to an area of activity.

Entrepreneurs who are willing to engage in business, may perform the following operations in the State Portal:
- registration and change of data of an entreprise
- applying for an activity licence to start up business
- other necessary e-services related to the point of single contact.

The point of single contact includes the following services and information (both in Estonian and English):
- making queries to public registers
- making queries by authenticated users concerning information available about their company in different registers
- step-by-step guidelines for starting up business and a shortcut to the entrepreneur's portal of the Com-

mercial Register; information on operating and closing down the business, and links to related services
- instructions and application forms for applying for an activity licence; the option of making queries to the EMTAK information system to identify possible special requirements; links to related agencies; shortcuts to the Register of Economic Activities and other registers the application forms that are not available in the Register of Economic Activities are made available as electronic forms that can be
  º digitally signed in the portal and submitted to a competent authority
  º filled in by unauthenticated users in the portal and downloaded, e.g. in PDF, for printing or saving
- the digital signature application for entrepreneurs for digital signing and viewing of documents that respective entrepreneurs have submitted through the State Portal, while each enterprise will have 100 MB of server space for storing their documents
  the contact data of competent authorities
- the contact data of professional organisations and associations
- Links to the single contact points of other EU Member States
- information about legal remedies
- the option of giving feedback on the information and services provided in the point of single contact
- user support

In 2010, the following developments have been planned:

- improvement of the point of single contact based on feedback from its users
- personalisation of the point of single contact for authenticated users so that after logging in information about their company is displayed, such as:
  - notifications of regulatory changes regarding their area of activity
  - notifications and reminders regarding due dates approaching (e.g. submission of the annual report; payment of taxes), whereas notifications can be ordered by e-mail or SMS
- entrepreneurs can design their view in the point of single contact by defining their topics of interest and their desired order of display
- new services for entrepreneurs will be integrated into the point of single contact
- the administration of changes of classifications will be completed

3.1.6.
ADDRESS DATA SYSTEM IN 2009

MALL KIVISALU
mall.kivisalu@maaamet.ee
Estonian Land Board

On 1 January 2009, the Address Data System (ADS), which contains all the address data of the state, was officially launched. ADS is a support system for the maintenance of databases. The purpose of the system is to ensure a unique identification of address objects both at their location and in different databases, and to make comparable geographical addresses that have been submitted in different times and according to different principles. Another task of ADS is to guarantee common organisation of determining geographical addresses and of processing address data.

The generation of the central address data system started in 2005, when the first version of the ADS concept document was prepared. The preparation of respective legal regulations started at the same time. The Public Information Act and the Government of the Republic Regulation "Address Data System" form the legal basis of the functioning of ADS since 2008.

The actual implementation of ADS started in 2007. By the end of the year, after two state-funded development stages, the ADS concept document had been supplemented, the ADS specification completed, the land register interfaced, a succession of X-Road services set up, the public map application was running and the ADS management system operating.

Unique identification of address objects both at their location and in different databases.

The third development stage unfolded in 2008. In August the Register of Buildings and in December the Place Names Register were interfaced. Data between the interfaced registers are synchronised via X-Road services.

The project of improving address data availability (AKP), financed from the EU structural funds, was launched in 2009 to last until June 2010. The purpose of AKP is to collect and arrange the address data of buildings and to develop the unofficial part of ADS for address data management.

Around 647,000 buildings are entered in ADS via the Register of Buildings. Approximately 51,000, or about
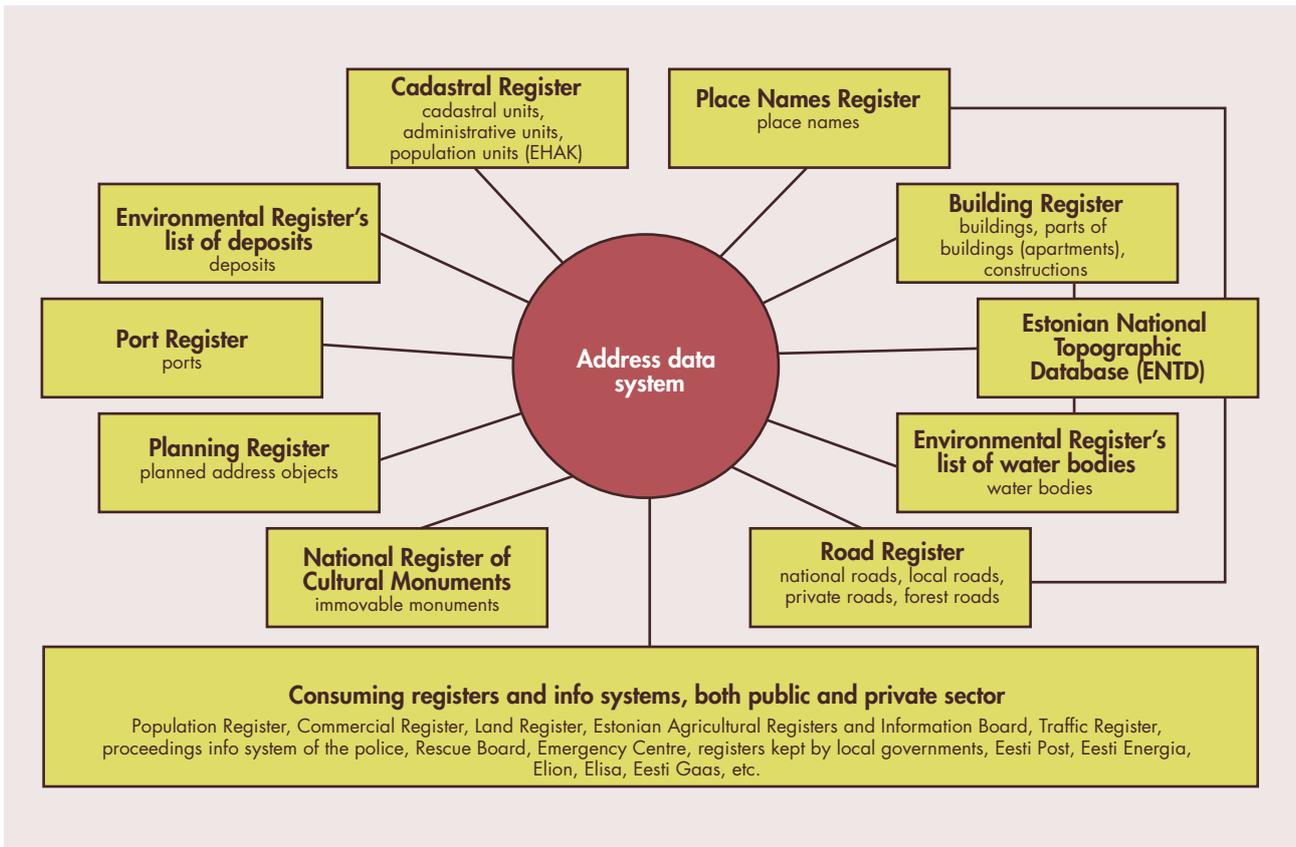
FIGURE 1. ADS Management System

8%, buildings have geocoded data. This means that the data of the Register of Buildings allows to identify the location of 8% of buildings on the map. The objective is to make 100% of buildings available on maps, which means that in the course of AKP each building in the Register of Buildings will be linked to a respective geographical location.

The address of around 115,000 buildings in the Register of Buildings is incomplete, ending either at village or town level. Such buildings need accurate geographical addresses. It is necessary to check and specify the purpose of each building and link addresses to buildings, or in other words, to geocode; that is, to equip with a sufficiently accurate spatial figure.

The spatial data of mapped buildings is stored in the Estonian National Topographic Database (ENTD), but it does not contain address information or sufficiently accurate information on the purpose of buildings. ENTD includes about 772,000 buildings, which means approximately 125,000 buildings are absent from the database. These should also be provided with sufficiently accurate geographical address and purpose info, so that it would be possible to register them in the Register of Buildings.

The project outcome will be a collection of the addresses and other attributes of all existing buildings.

As a result of the project, the addresses and other attributes (usage data, info on living spaces, etc.) of all buildings will be collected and linked to the topographic database's data on buildings. In addition, the buildings absent from ENTD will be mapped and information will be gathered on buildings that have been either destroyed or markedly reconstructed. Data will be migrated onto the unofficial layer of ADS and made available in the X-Road and public applications of ADS. The collected data will be useful in many areas like statistics, the work of the Rescue Board, in police work, in the Population Register and in the Commercial Register, to name a few. Unofficial address data can be used in arranging the official addresses in the Register of Buildings, contributing to the improvement of the official ADS data.

When the project is completed, the data on spatial figures of ENTD will be updated on the unofficial layer of ADS.

Introduction of the ADS Management System

The ADS Management System includes the names of all administrative and population units, small places (e.g. gardening associations), traffic areas (e.g. streets) and the geographical addresses of cadastral units, buildings and apartments.

ADS allows using addresses and searching for objects in the nature, on maps and in information systems. However, ADS does not contain personal information,

which means it is impossible to make queries in the database using people's names. This information is managed by the Population Register.

Only databases that have land-related objects as their main objects can provide data to ADS. The primary data sources are the Place Names Register, the Register of Buildings, the Cadastral Register, and the Road register. ENTD itself does not directly forward data, but since it contains, for instance, the spatial data of roads in the Road Register and of many place name objects, the structure of data exchange includes the option of updating some of the data directly from ENTD.

Data have been divided into three main entities in the ADS database:

- address objects (land-related objects, such as administrative units, streets, buildings, constructions, land units, protected objects, mineral deposits, etc., which have been allocated an address). The address object cannot change its location and its address may change only in the case of reorganisations in the address system (changes in administrative and population distribution, renaming streets, changes in the shape or border of address objects, etc.);
- geographical addresses, which are textual-numerical entries or attributes proceeding from the hierarchy of territorial administrative division and from official place names. One object may be designated several geographical addresses. Such addresses are parallel addresses, and they are equal;
- address components that are essentially classifications.

In addition to the data of the main entity, ADS also maintains and analyses relationships between main entities. For example, after each alteration event, mutual relationships between address objects, geographical addresses and address components are preserved and analysed. A spatial analysis establishes the spatial addresses of address objects and compares whether their spatial address and entry-format geographical address are in compliance. The X-Road is used to notify consumers of all changes in data (query of address changes and query of changes in the address components classification), as well as of logic errors in data and possible needs for alterations (notification service regarding the need to change addresses).

At the end of 2009, ADS included:

- around 1,765,000 objects
- around 1,244,000 valid addresses on objects in total
- around 14,000 traffic areas (e.g. streets)
- around 1,000 small places (e.g. gardening associations)

One object may have several addresses and several objects may have the same address.

The Estonian geographical addresses have eight component levels.

Figure 2 displays the levels, or address components, that a geographical address consists of. The arrows show
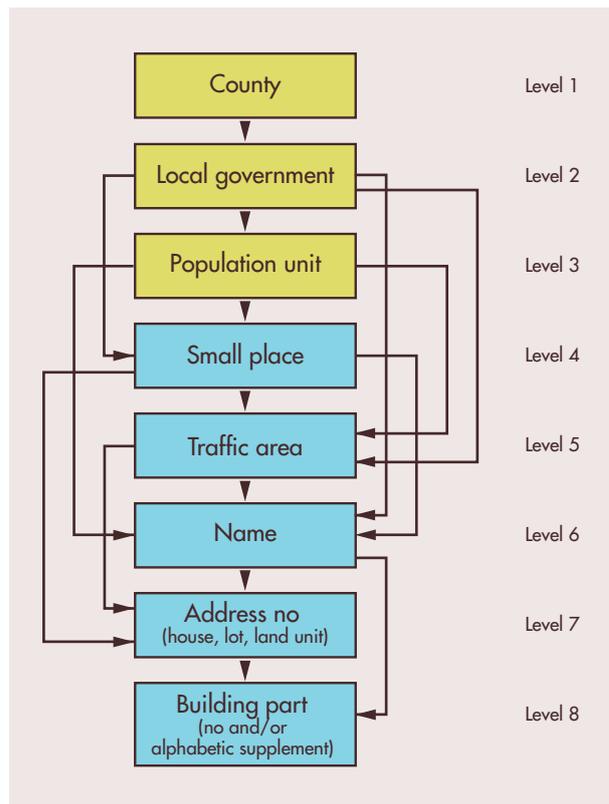
FIGURE 2. Mutual relations between components in geographical addresses

which possible subordinating levels are higher in the hierarchy.

ADS helps ensure common spelling of addresses, which is also referred to as *normalisation*. In normalisation, the address text is divided into levels and the usage of, for example, small and capital letters, spaces and abbreviations, is harmonised. ADS provides technical capabilities for connecting data on the basis of geographical addresses.

A component is valid only if there is a valid object initialising the level. For example, the Place Name Register's objects 'small places' initialise level 4 and traffic areas level 5 and objects from any other database cannot initialise these levels. The objects, buildings and parts of buildings (apartments) of the Register of Buildings are allowed to initialise levels 6, 7 and 8. If an object becomes invalid in the Register of Origin, the respective-level component with all its sub-components does the same.

ADS helps ensure common spelling of addresses.

Public applications of ADS

Further information on the public map applications of ADS is available in the Services section of the Land Board's Geoportal[55] (see Figure 3, arrow 1), by clicking

55   http://geoportaal.maaamet.ee

FIGURE 3. Land Board's Geoportal homepage

"Map applications" and then "Address data application" (in Estonian only). The public map application of ADS can be opened in the Land Board's Geoportal (see Figure 3, arrow 2).

Address query is also available right on the home page of the Geoportal, before entering the Services section (see Figure 3, arrow 3). If you type in the address and click "Search for an address", the address data application will open and display the object on the map. If there are more than one search results, a list of the objects found will be displayed and the user can choose the object he or she wishes to see on the map. It is also possible to make a new query there.

Plans for 2010

Although the primary functionality of the ADS Management System has been developed and is in active use, there are plans for further development. The concept document provides a general vision of the possible developments of ADS. In 2010, within the framework of projects already running and funded by the EU structural funds, it is planned to:

- finish the AKP project started in 2009 and introduce the unofficial address data part of ADS; make available to the general public the address data on collected and reconstructed buildings and parts of buildings via the public services of the X-Road and ADS
- design a public alphanumeric application of ASD, which allows large-volume queries (in both official and unofficial address data) and free download of data
- supplement the administration of the contiguity ratios of components and geographical addresses and make information on contiguity ratios available to consumers
- supplement the treatment of commemorative names (e.g. streets named after a person) in ADS
- supplement the control rules of the contents of components and of buildings' spatial figures.

We hope that the developments already available allow consumers of address data, such as the Population Register, Commercial Register and AS Eesti Post, to interface to ADS already in 2010.

3.1.7.
eLEARNING DEVELOPMENT CENTRE

ENE KOITLA
ene.koitla@eitsa.ee
eLearning Development Centre
Estonian Information
Technology Foundation

The eLearning Development Centre was established as an independent structural unit under the Estonian Information Technology Foundation (EITSA) on 2 May 2006. Prior to that, the field of eLearning in the Estonian vocational and higher education was coordinated by two consortia: the Estonian eUniversity (founded on 22 February 2003) and the Estonian eVET (founded on 16 February 2005). The legal person of the consortia is EITSA and the governing bodies are the Council of the Estonian eUniversity and the Council and General Council of the Estonian eVET respectively.

The principal objective of the eLearning Development Centre is to increase the quality and efficiency of learning in Estonian higher and vocational education through extensive introduction of methods of eLearning and information and communication technology (ICT). The concept of eLearning should become an inseparable part of the daily learning process.

By the quality of learning we mean the quality of the learning process. The quality of the content of education does not depend on learning methods, and the eLearning Development Centre does not aim to evaluate or improve the quality of training courses but to contribute to raising the quality of the learning process. eLearning is not about imitating the existing learning process through means of ICT, but the reorganisation of learning with the help of new means. The introduction of eLearning does not entail giving up good learning and teaching methods, it rather improves and expands them.

Increasing the quality and efficiency of learning through extensive introduction of methods of eLearning and ICT.

Completion of the curriculum partly or entirely through e-learning courses helps improve the quality of the learning process in vocational and higher education. Learning will be more open, as e-learning allows everyone to acquire education at any time regardless of age, work, geographical location or special needs. The use of e-learning methods and ICT will make the study

process more effective both for students and the society. Student can make a maximum of their time and financial resources, and the same applies to teachers.

eLearning enables
- to raise the quality of learning by improving communication between educational establishments and teachers, and by integrating different subjects and forms of tuition
- to make learning more effective and accessible, and thus maximise the potential of all members of the society
- to develop motivating and student-oriented forms of tuition, where students play a greater role in shaping the study process, and this way create a study environment that supports learning in the best possible way
- to fundamentally change the content of teaching by providing opportunities for individualising the learning process and making it creative and flexible, while taking into account the students' needs

The main focus of the Estonian eUniversity consortium and the Estonian eVET consortium has been on five fields:

1. Development and support of teachers
A three-level training system has been established, consisting of basic, intermediate and expert training courses, which is related to teachers' competence in education technology.[56]

In 2004, the position of education technologist was established in the institutions of higher education. In January 2009 there were a total of 56 education technologists in the institutions of vocational and higher education (42.1 positions; 36 technologists in the eVET and 20 in the eUniversity). In January 2009 also the position of an e-learning support person was created (by 2013, 11.5 positions will be in place) and two multimedia centres were founded in the Tallinn University of Technology and the University of Tartu.

2. Development of content for e-learning
Institutions of vocational and higher education have received support in developing e-courses and 900 learning objects in the total amount of 2,000.5 credit points.

A call for application for a quality label is organised every year, and the e-course of the year is elected from among the vocational and higher education courses applying for the label.

3. e-learning infrastructure
The eLearning Development Centre had six servers in January 2010, which supported three learning environments: Blackboard VISTA, IVA and Moodle. The

Centre also manages the eLearning Portal[57] and a video conference system that covers the entire country.

4. International cooperation
The eLearning Development Centre belongs to two consortia: the European Distance and eLearning Network (EDEN) and the European Foundation for Quality in eLearning (EFQUEL).

The Centre coordinates two and participates in seven international projects.

5. Awareness raising
A spring conference and an autumn conference are held every year. The Centre also publishes an eLearning Newsletter[58] and organises e-learning information days. In addition, thematic seminars are held and an e-learning day together with eTV, a TV programme on e-learning, is organised every year during the adult learner week.

There are over 3,000 e-courses in the institutions of vocational and higher education with around 60,000 learners in total (2009 average). eLearning is primarily used to support auditory studies.

56   http://www.e-ope.ee/en/teachers/teacher_training

57   http://www.e-ope.ee

58   http://portaal.e-uni.ee/uudiskiri (in Estonian only)

3.2. *Increasing the competitiveness of the Estonian ICT sector*

3.2.1.
COOPERATION: FROM CLICHÉ TO ACTION

TAAVI KOTKA
taavi.kotka@webmedia.ee
Estonian Association of
Information Technology and
Communications (ITL)

The Estonian Association of Information Technology and Telecommunications (ITL) is a voluntary organisation, whose primary objective is to unite the Estonian information technology and telecommunications companies, to promote their cooperation in Estonia's development towards information society, to represent and protect the interests of its member companies, and to express their common positions.

ITL has had this objective since the start of its operation, but never before has it been as meaningful as in 2009. How come?

The ICT sector has been rather fortunate in the recent years: there was more work than could be done, prices were stable and profits were easy to come. The idyll was shattered only by scarcity of labour and the resulting pressure on unit labour costs.

The dream ended at the beginning of 2009, when recession that had broken out six months before finally hit the ICT sector. Clients suddenly tightened the purse, ICT investment contracted drastically and major export partners (Finland, Sweden) abandoned their nearshore partners.

The crisis hit hardware sellers the hardest. Turnovers and profits dropped, which required rapid response from software manufacturers and telecoms, as the financial sector, the largest user of ICT services, was forced to cut down personnel. Only the Estonian development centres of major contractors could breathe with relief, being able to prove their importance to parent companies.

At one point, the sector had to face the reality and

FIGURE 1. The board of ITL and primary areas of activity

look for new alternatives. The local market had dried up and could not provide for everyone any longer. What next?

Adjustment takes time and money

No company starts exporting overnight. Product/service development, getting to know the target countries, and finding new sales channels – all this takes a lot of time and investment. Neither is it possible to adjust our human resources to the changed market situation, as retraining also requires time and investment. Some logical questions follow:

- What should each individual company toss its investment money in Estonian IT education, instead of joining investment with other similar companies to achieve common objectives?
- Why should every company go and seek new target markets if it is possible to share experience with others?
- Why not offer also others' products at sales meetings together with company's own products?

All these and also other questions can be expressed by one keyword, *cooperation*. And so, we are back to the primary objective of ITL defined in the introduction. Until 2009, cooperation in the ICT sector was merely a cliché. At the end of 2009, the situation is not much better but the ice is melting, with ITL, the umbrella organisation, acting as a good example.

ICT companies has a very strong growth potential, as generally reflected by the profits of 2009. This clearly shows that the ICT sector has coped much better with the economic downturn than other sectors. However, the sector is just gaining momentum and the following issues need to be addressed:

- the internationalisation of IT education and a steady increase in education quality (IT Academy initiative)
- growth in ICT exports (development of a demo centre, export cluster, etc.)
- inter-sectoral cooperation, as ICT provides the means for realising the additional potential of other economic sectors
- the development of information society and IT infrastructure in Estonia, as we have plenty of ideas new to the rest of the world (at least at national level)
- sectoral cooperation and a steady rise in ITL membership

All this may sound like some political babble and, to be honest, without having seen the daily work of ITL's executive team and area managers, it would be hard for me to believe in the joint efforts of Estonian ICT companies. The constant rise in membership, completion of joint projects and an inflow of new ideas clearly shows that there is no ground for scepticism.

3.2.2.
ESTONIAN IT ACADEMY

ÜLLAR JAAKSOO
ullar.jaaksoo@itacademy.ee
Estonian Development Fund

At the beginning of the 2008 autumn semester, the rectors of major Estonian universities and the Estonian Association of Information Technology and Communications (ITL) digitally signed a cooperation agreement to found the Estonian IT Academy, an initiative of the Estonian Development Fund. The Estonian IT Academy is the umbrella name given to a joint initiative aimed at elevating Estonia's higher education in the field of information and communication technology (ICT) to a new level so that it would be capable of an international breakthrough.

This entails world-class higher ICT education, which would:

- be interdisciplinary
- appeal to talented Estonian and foreign students
- attract top professors and researchers
- contribute to international ICT or ICT-based business conducted by Estonian companies
- prompt a new wave of foreign investments channelled into Estonia.

Ideally, the Estonian IT Academy will be a modern study centre that is acknowledged by world leading universities, that is desired by other Baltic Sea countries, and that is preferred by the majority of students in our target markets.

A life belt and
a major opportunity for Estonia

The initiative was born out of the Estonian Development Fund's EST_IT@2018 foresight conclusions. The take-up of ICT has accounted for around a half of Europe's productivity growth. Estonia has plenty of unrealised potential to reap even greater benefits from the ICT.

Regrettably, the shortage of thousands of ICT specialists does not enable to utilise the ICT potential in Estonia. Therefore, it is difficult for ICT companies to expand their business activities in Estonia. The current economic crisis and an overall increase in unemployment have not eased the problem: according to employment agencies, there is a persistently high demand for ICT specialists persists, with every tenth vacancy being for computer specialists.

The underlying reason is the insufficient number of
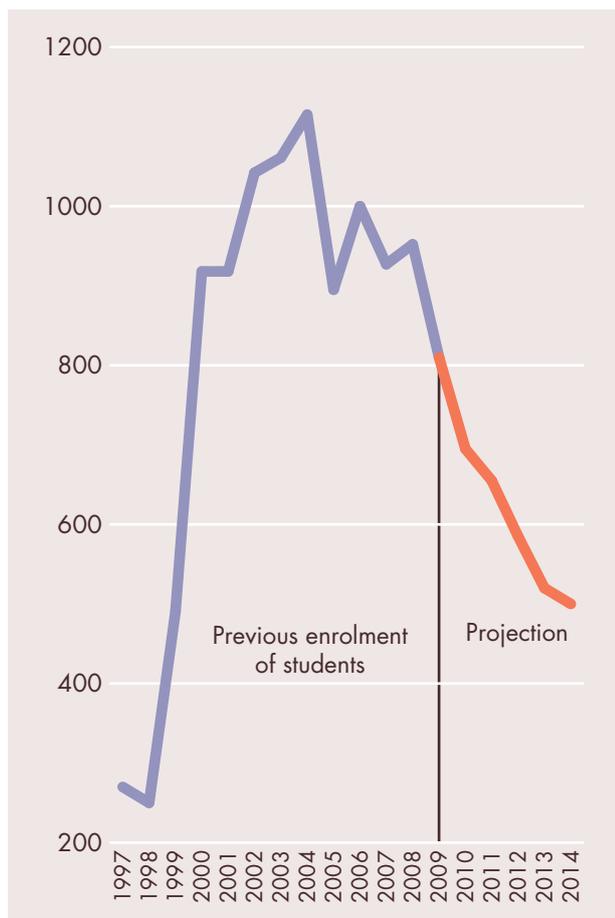
FIGURE 1. The number of new IT students is plummeting
Source: Estonian Development Fund

FIGURE 2. Estonia needs ten times more foreign ICT students

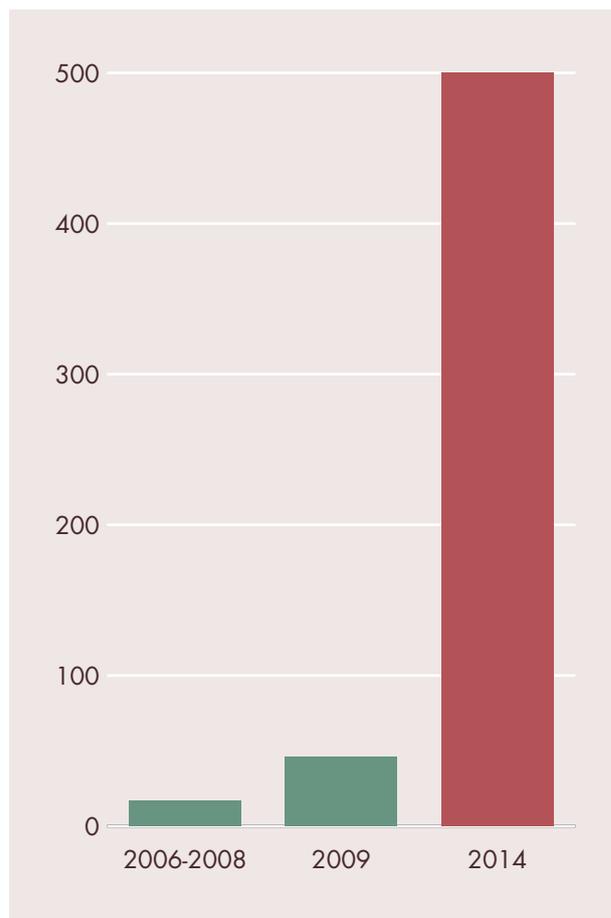students, graduates and post-graduates in ICT curricula. Problems will deepen in the future if no joint action is taken: the supply of highly qualified ICT specialists will decrease further in the coming years due to Estonia's demographic trends.

In 2014, the number of high school graduates will plummet by nearly a half from the current 12,000. For higher ICT education this denotes a decline to five hundred students enrolled in computer sciences programmes, compared to the one thousand students currently commencing their studies in this area. Should the efficiency of the education process remain unchanged, the number of ICT graduates would drop from some 350 today to just 190 a year.

The shortage of thousands of ICT specialists does not enable to utilise Estonia's ICT potential.

Considering that the share of ICT students is not expected to surge and also the future demographic trends in Estonia, we have to face the truth and recognise the fact that the Estonian ICT sector will be suffering from labour deficit. There will be less orders, the cost of work will increase due to weak supply and Estonia's current reputation as a successful IT country will be history.

A possible solution is to become significantly more active in bringing foreign students and lecturers to Estonia. In order to achieve that, needless duplication in Estonia's higher ICT education must be avoided and all efforts should be pooled towards cooperation outside Estonia. A systematic inclusion of foreign students from target countries relevant to us will help underpin the efforts of Estonian companies seeking to operate in these markets and to increase their export revenues.

Considering the deepening shortage of ICT specialists, **the goal of the IT Academy is to make sure that the number of students commencing studies in ICT in Estonia would remain AT LEAST at the current level and that most of the students would complete their studies on schedule.**

The signatories of the cooperation agreement have decided to prepare a business plan by autumn 2010 at the latest by trying out different possibilities, agreeing on necessary steps and then mobilising resources into carrying out the vision. We hope that the business plan and the experience from this pilot project will be of broader use and will contribute to the effective and rapid internationalisation of Estonia's higher education.

3.2.3.
TIGER UNIVERSITY: A HIGHER EDUCATION PROGRAMME FOR ICT

MARILY HENDRIKSON
marily.hendrikson@eitsa.ee
Estonian Information
Technology Foundation

The Tiger University, the Estonian national ICT programme for higher education, was approved by the Government of Estonia in 2002. The main goal of the programme[59] is to support and facilitate competitive research and development in the field of ICT in the Estonian public universities and related academic higher education, and the development and modernisation of the ICT infrastructure.

The second goal is to raise additional funds for the programme from other sources, including co-financing by private and non-profit sectors, and the structural funds, cooperation and aid programmes of the European Union. The Tiger University+ (2009–2012) continues implementing the objectives of the Tiger University Programme carried out in 2002–2008.

The Tiger University Programme supports the development of the ICT infrastructure and the improvement of the study environment, ICT teaching staff and post-graduate training in ICT at the Estonian higher educational establishments. To this end, the Estonian Information Technology Foundation, the manager of the programme, has organised **83 open calls for projects** during 2002–2008. As a result, 644 project and mobility grants in the total amount of 43.1 million kroons have been allocated to research and development projects of universities; in-service training for teachers; mobility of teachers and post-graduate students; research grants for post-graduate students; ICT study and science laboratories; projects aimed at strengthening ICT curricula, such as inviting guest lecturers or developing and revising curricula and study materials; procurement of special software and scientific literature, etc. In addition, 116 allocations in the total amount of 69.6 million kroons have been made to major universities providing

Supporting competitive research and development in the field of ICT in the Estonian public universities.

higher ICT education to develop and modernise their ICT infrastructure (computers, servers, networks, network security, etc.).

In 2003, the **Estonian eUniversity**, a consortium of major Estonian universities promoting e-learning, was launched under the Tiger University Programme. The Tiger University Programme has allocated a total of around 17.4 million kroons to the eUniversity in 2003–2009.

In 2004, the Tiger University allocated 2.58 million kroons for launching and implementing the **Admission Information System** (SAIS)[60] that enables to submit electronic admission applications to the vocational and higher educational establishments that have joined SAIS. SAIS is interfaced to state databases, which means that there is no need for students to submit documents on their previous education, state exam results or school results reports, which facilitates the admission process both for applicants and educational establishments. The SAIS consortium currently includes five universities, eleven institutions of professional higher education and eight vocational educational institutions.

Admission Information System (SAIS) – for submission of electronic admission applications to educational establishments.

SAIS was completed in June 2005, and since July 2005 SAIS belongs to the Ministry of Education and Research. From November 2005 to December 2009 the system was administered by the National Examination and Qualification Centre. Since January 2010, SAIS has again been operating under the Estonian Information Technology Foundation (EITSA).

In 2005, EITSA initiated the establishment of **two new ICT chairs** under the Tiger University Programme: the Chair of Distributed Systems was founded at the University of Tartu, and the Chair of Sensor Signal Processing at the Tallinn University of Technology was modernised. The development of these two chairs lasted for four years and involved the establishment and modernisation of relevant studies and international cooperation contacts, the development of curricula, conduct of modern research and development, and

New chairs and development projects of ICT.

the creation of efficient academic teams. During these four years, EITSA provided a total of 5.5 million kroons to the projects, while the beneficiaries contributed 4.78 million kroons.

In 2009, EITSA started to support three new **ICT development projects** under the Tiger University Pro-

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59   http://www.eitsa.ee/?url=tigeruniv_program

60   http://www.sais.ee

gramme. Namely, the Chair of Bioinformatics and Data Mining will be founded at the University of Tartu, a research laboratory for embedded systems will be established at the Tallinn University of Technology, and a curriculum for interaction design will be developed at the Tallinn University. A total of 7.8 million kroons will be allocated for these developments until 2012, with beneficiaries themselves contributing at least 10.7 million kroons.

The development of the **Estonian Information Technology College**[61], which was founded in 2000, has largely relied on the Tiger University Programme. The College has received 13.2 million kroons from the Tiger University Programme and over 14 million kroons from direct sponsors in 2002–2009. At the beginning of 2008, the College moved into a new building, which is located near Tallinn Tehnopol and the Tallinn University of Technology. The Information Technology College participates in the Estonian IT Academy initiative, which aims to elevate Estonia's higher ICT education so that it would be capable of an international breakthrough. This is an initiative of the Estonian Development Fund, and it involves also the Estonian Association of Information Technology and Communications, the Tallinn University of Technology, the University of Tartu, and the Tallinn University.

An initiative of the Estonian IT Academy to elevate Estonia's higher ICT education so as to achieve an international breakthrough.

Total funding for the fields of study supported by the Tiger University in 2002–2009 amounted to **186 million kroons, with 108.8 million kroons coming from the state budget and 77.2 million kroons from other sources**.

Initially, a total of 320 million kroons for eight years was planned for the Tiger University Programme. So far, **237 million kroons** (74% of the initial plan) have been allocated: **135 million kroons (59%) of state budget funds** instead of the 228 million kroons planned, and 92 million kroons from other sources.

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61 http://www.itcollege.ee

3.2.4.
SOFTWARE TECHNOLOGY AND APPLICATIONS COMPETENCE CENTRE – THE LINK BETWEEN RESEARCH AND PRODUCT DEVELOPMENT

PEEP KÜNGAS
peep.kungas@stacc.ee,

MARION LEPMETS
marion.lepmets@stacc.ee

JAN WILLEMSON
jan.willemson@stacc.ee

JAAK VILO
jaak.vilo@stacc.ee
Software Technology and Applications Competence Centre

The Software Technology and Applications Competence Centre (STACC) is a research and development organisation established in 2009 to conduct high-priority applied research. STACC is a joint initiative between the University of Tartu and Tallinn Technical University as the centres of science in Estonia, and Cybernetica AS, Regio AS, Webmedia AS, Logica Eesti AS, Quretec OÜ, Know IT Estonia Consulting OÜ, Delfi AS, the East Tallinn Central Hospital, Skype Technologies OÜ and Swedbank AS as the leading IT companies and users of Estonian software and knowledge-based technology. STACC aims to conduct ap-

Data mining and data integration

Web analytics and social network analysis	Biomedical data integration and mining	Privacy-preserving data mining
Delfi, Logica, Quretec, Regio, Skype	ITK, Cybernetica, Quretec	Cybernetica, Quretec, Swedbank

Software and services design

Smart Internet applications	Smart services	Software development productivity
Delfi, KnowIT, Logica, Regio, Webmedia	Logica, Webmedia	Cybernetica, Logica, Webmedia

FIGURE 1. Action lines and programmes of applied research

plied research in software technology by working with suppliers and users of technology from among its owners and from outside. The mission of STACC is to enhance the skills and competitiveness of organisations that are closely involved in software technology in Estonia, while increasing their export potential and gains on software solutions.

As some of the owners of STACC are closely involved in software development in the public sector, it is only natural that some applied research projects focus on the specific needs of the pubic sector. The applied research from STACC paves the way for the development of new products and services that use software technology to enter new markets, while addressing major trends and solving critical problems.

To support its mission, STACC conducts applied research into Data Integration and Mining (DIM), and Software and Services Engineering (SSE). The DIM projects mainly focus on:
- web analytics and social network analysis
- biomedical data integration and mining
- privacy-preserving data mining
- The SSE projects address:
- smart internet interfaces
- smart services
- software development productivity

The following is a review of specific projects conducted by STACC in its first year of activity.

Web Analytics And Social Network Analysis

Social network analysis. Social and communication networks have enjoyed a tremendous surge in popularity recently, drawing together friends, acquaintances, colleagues and other people with similar interests or backgrounds. These networks also produce a major portion of Internet content services, such as blogs, photo and video archives, and interest group forums. Web marketing and user-oriented advertising are gaining considerable ground too. The aim of social network analysis is to explore methods for analysing global networks, their structure, nature and evolution (generative models); to identify specialised sub-networks; and to predict changes in user behaviour for better or worse. This knowledge can be used to offer new services to users faster and more conveniently, while preventing criminal and malicious activities like spam and scams. The main client of the project is Skype, which has a network of half a billion users.

Exploring methods for analysing global networks.

Web log data mining. Web log data mining draws on the fact that all web, mobile and computer-based software programmes save log entries about users. The challenge is how to identify typical users and their usage habits

from logs and to compare the actual use of software applications to the initial visions of the software developers. The project aims to develop a program that can save and import usage logs into a data warehouse and use cluster analysis to identify user groups, in order to visualise and describe different usage patterns so as to help software designers in making decisions. For instance, user interfaces could be optimised and modified to allow users to use them the way they want.

Predicting user behaviour. While web log data mining works with logs of past activities, the latest trends, and typical user groups and interests, then predicting user behaviour anticipates the behaviour of users in soft

Solutions for automatic user analysis to provide a better user experience.

real-time. Its goal is to explore solutions for automatic user analysis by identifying the very latest trends and user interests and by adapting user interfaces accordingly, thus providing a better user experience.

Biomedical Data Integration And Mining

Biomedical data integration and mining addresses the fact that ever more electronic data is being gathered in the health system. Many health files are already electronic, laboratory data are being added and biomarker methods are being improved. While most of these processes are concentrated on gathering and presenting the data of individual patients, a higher objective is the statistical analysis of global trends in order to improve the entire health system and make it more information-based. We have launched four biomedical research projects that complement each other to pursue this objective.

Cohort of smokers for predicting COPD. The object of our research is Chronic Obstructive Pulmonary Disease (COPD), a complex but widespread and dangerous disease. The objective is to develop methods for an automatically identifying higher risk smokers from their early complaints, to monitor these patients, and to study potential genetic and other biomarkers using blood and other analyses. The medical side is managed by Professor Ruth Sepper from the Technomedicum of Tallinn Technical University. Data analysis requires data from the medical system to identify smokers, analyse their complaints and establish ontologies.

Data warehouse. Although a lot of medical information concentrates on individual patients' complaints and medical data, the data of all patients are needed simultaneously for hospital management and for epidemiological and methodological research. The data warehouse project aims to develop solutions to collect data in a uniform and comparable form and to integrate

them into a data warehouse, where global analyses can be carried out by hospital management and specialist doctors. For instance, research may look at patients with similar diagnoses by comparing two or more typical medical treatment methods or medicaments and identifying their advantages in different circumstances.

The data of a data warehouse can be used for forecasting trends and for better planning of resources.

The data can also be used for forecasting trends and for better planning of resources. The data warehouse should allow ad hoc queries – questions that have not been asked before. The design of a data warehouse is complicated by the diversity of data, as different diseases may have very different and unusual parameters. The goal is to determine which services are highest priority for hospital management.

Ontologies and other semantic assets. Data analysis is generally possible if data can be classified. The aim of this project is to find the best types of classification, ontology and multiple choice for data. The issue is not about the form of classification or the description of the available information, but how it can be presented so that the doctors and nurses as end users could access the data in the shortest possible time.

Analysis of medical free texts. Hospitals and the health system in general produce large amounts of freely-written medical texts, such as descriptions, complaints, treatment summaries and decisions. In recent years many, though not all, of these texts have moved from paper to an electronic format, though this has not been followed by a qualitative leap in their interpretation. By analysing free texts we wish to explore the application of linguistic and statistical methods to medical texts. Such an analysis would allow automatic separation of information and data, so that texts could be decoded into facts using ontologies and machine-readable relationships between the

Data mining projects focusing on the methods of explicit data collection and analysis.

agents, activities and subjects. The decoded data can be used for purposes of statistical analysis, the identification of similar medical cases, analysis of complaints and activities, and for other purposes.

Privacy-Preserving Data Mining

While the two first projects focused on the methods of explicit data collection and analysis, privacy-preserving data mining handles data in such a way that none of the computing parties has access to the microdata.

In order to facilitate computing, the data is shared berween several computers (so-called *miners*) in such a way that all the shares are indistinguishable from random noise, when considered in isolation. This approach facilitates research projects in which no one has to disclose real data and in which only aggregate results are important. Such a solution may be appropriate is sensitive domains, such as the planning and implementation of public auctions, analysis of indicators that are subject to non-disclosure to protect business secrets, or the processing of highly sensitive personal (e.g. medical) data.

The objective of the three main sub-projects is to develop data handling methods to be used with highly private data like health or financial information or any other delicate data. Most parts of the project are linked to the Sharemind secure distributed computing platform. The objectives are:

- to establish a convenient environment for programming and testing secure distributed algorithms (primarily IDE and debugger)
- to test secure computing for processing survey data as realistically as possible
- to develop a general tool for processing the security proofs of the cryptographic protocols to be used to prove the security features of the distributed computing algorithms.

The fourth sub-project addresses the need to test major information systems before they are adopted. Software developers are naturally interested in testing their applications with data that are as real as possible, which is why

Data mining in such a way that none of the computing parties has access to the microdata.

test data are often drawn from real operating environments. These data, however, might include various delicate components that software testers do not need to see. Therefore, real databases should first be disguised by generating a base of artificial values following particular rules, and the main object of this research is to find a way to integrate such a solution into the software development workflow.

Smart Internet Interfaces

The primary goal of this sub-project is to develop technologies that would simplify the creation and use of Internet applications. The driving concept here is *rich Internet applications* (RIA), which covers both traditional standards like HTML, CSS and ECMAScript, and modern technologies such as AJAX, Silverlight, Flex, JavaFX, and others.

Content extraction, analysis and aggregation. This work package aims to develop techniques and technologies that would facilitate the aggregation of rich Internet components (RIC), such as widgets, gadgets or floatlets, or simpler components, and online content. Since the majority of Internet content is still unstructured and available in textual form, like online articles, this subproject explores how to apply language technology to separate, analyse and merge textual content automatically. In addition, the work package explores techniques and frameworks that would simplify both interaction between components themselves and online content, while developing rich Internet applications.

Enhanced usability of rich Internet applications. Usability is an integral part of product development for physical products, traditional software and rich Internet applications alike. As global trends in web applications are increasingly moving towards adoption of RIAs, it is essential to understand

Rich Internet applications (RIA).

what the application of particular technologies mean for web application users. RIAs can be built from conceptually orthogonal technologies, which is why it is necessary to understand better the total effects of these technologies for the usability of a particular piece of web application.

Although there exist globally well-known best practices available for designing modern RIAs and ensuring usability, in practice still many man-hours are spent for reaching satisfactory level of usability. Moreover, aligning usability maintenance with the entire software application life-cycle, including managing transitions from one application version to another, is still a challenge, which needs special focus..Therefore this work package aims at first specifying detailed characteristics of usability and then to provide a methodology and a set of guidelines to achieve and evaluate the characteristics

Rich Internet application cross-browser compatibility testing. One of the main challenges in cost-effective development of Internet applications is related to the large number of different browsers and their versions available, which all should provide the same level of user experience and the same behaviour when exploiting an Internet application. Although majority of these browsers and their versions are HTML compliant, there are differences in the way they visualise online content (including software applications) and in the behaviour they provide to the same content and online applications. Thus, in practice it cannot be assumed that a single web application is interpreted in the same way by all versions of all browsers. This problem is exaggerated due to widely used less-standardised RIA technologies, such as JavaScript. This is why so much effort is dedicated to redesigning online applications each time support for a new browser or its new version would be provided. Or symmetrically, this is why so many web applications

are designed for and selectively tested under only some browsers leading to only partially functional Internet applications.

A solution to this problem would entail automating cross-browser compatibility testing of developed RIAs. The aim of this work package is to develop methods for automated detection of potential deviations from expected layout and behaviour under specific browsers. This would significantly increase software development productivity.

Smart Services

The overall aim of this sub-project is to develop a framework for rapid and lightweight integration and management of software service networks. Software service networks consist of software services that are interconnected either directly or indirectly and that affect each other or partly depend on each other during their entire life cycle. The emphasis of the project is on compliance management, SLA management, and identification and exploitation of integration points in order to improve the usage of service networks.

Agile interoperation in service networks. Many government and enterprise applications nowadays require access to external data sources that are exposed as web services (e.g. services provided by the Estonian X-Road infrastructure). A significant share of the effort in the development of such applications goes into building wrappers and adapters to reconcile differences between the data models used by the external information source, and the data models used internally by the application. In addition to requiring significant effort, the development of such adapters is error-prone, since analysts and developers may easily misunderstand some of the data items exposed by the external information source, particularly when the documentation is scarce and incom-

A framework for rapid and lightweight integration and management of software service networks.

plete. Moreover, such wrappers and adapters need to be continuously maintained, bringing in additional costs. Even worse, in some cases the external information source may evolve unexpectedly and the wrappers/adapters may start misfunctioning as a result of such changes. Such events may go unnoticed for some time, leading to subtle errors that are only detected after they ripple down into other more noticeable and costly errors.

In this work package, we will investigate the state-of-the-art in information integration, and we will identify and apply leading-edge techniques to generate and to continuously maintain wrappers and adapters for the purpose of integrating external web-based information sources exposed as web services, into enterprise applications.

Smart monitoring in service networks. Service Level Agreements (SLAs) are an essential component in today's networked enterprise systems. SLAs establish non-functional requirements (typically performance-related) that must be fulfilled by an enterprise system during its day-to-day operations. In the context of service networks, failure by a service to meet its SLA may ripple down into further failures by other services in the network. For example, if a service X uses another service Y provided by a different organisation, and service Y fails to fulfil its SLA for a certain period of time, this SLA violation by Y may lead to failure by X to deliver on its SLA. It is therefore important that SLA is continuously monitored at various places in the service network, so that SLA violations by a service can be tracked down to either the service in question, or other services in the network. In addition, it is desirable that such violations are detected and reported as early as possible.

Beyond pure SLA violations, enterprise architects need to understand how variations in the performance of a service are affected by variations in the performance of other services. To this end, this project will design and develop proof-of-concept tools to visualise the performance of a service network in real time. Importantly, this visualisation will not focus on the performance at the technology layer (e.g. network latency and bandwidth), but will display performance at the business level.

Software products that could increase the efficiency of software development and improve the productivity of software companies.

Software Development Productivity

The objective of this project is to develop software products that could increase the efficiency of software development and thus improve the productivity of software companies. To this end, the project aims to devise methods and tools to enhance the productivity of software development efforts by eliminating inefficiencies in software development efforts through increased information visibility, increased automation and software reuse. The following is an overview of the four sub-projects of the productivity project.

Fast Dynamic Upgrade of Enterprise Applications. The context of this work-package is that of live application upgrade. Upgrading versions of applications running on JEE servers is a complicated process. Traditionally, application upgrade is done as an offline process, meaning that the server is shut down, the application is upgraded, and then the server is put back into service. Live application upgrade (also called dynamic upgrade) refers to the practice of upgrading an application with-

out interrupting the operation of the server. This way, users can continue using the application during the upgrade. The project will advance the state-of-the-art by developing new methods for incremental, on-the-fly migration of objects from one version of the schema to another, in the specific context of fast re-deployment of Java EE applications.

Project-Specific Domain-Specific Languages. Domain-specific languages (DSL) are used for complex software system development, as they increase the level of abstraction in programming. Language oriented programming (LOP) is an approach that divides the system into two components. One of them depends on the technology used, while the other depends on the particular task and is programmed in DSL, which hides the technical complexity of the system from programmers. This project concentrates on the use of Domain-Specific Languages (DSLs) tailored for specific software development projects. The goal of such project-specific DSLs is to empower analysts and domain experts to get more closely involved in the software development process, therefore leading to quicker turn-around times between change requests and their implementation in a software system

A set of tools to make Domain-Specific Languages for enterprise applications.

There are specific tools available to automate various aspects of DSL implementation, but there are no integral solutions to apply LOP effectively in enterprise software development, and this makes the use of LOP costly.

This project aims to develop a set of tools to make DSL for enterprise applications. The project draws on existing applications that use open source codes. Its primary tasks include choosing suitable applications from among those available, integrating these applications, and adding the necessary functionality.

Domain specific embedded languages. Domain specific languages, such as SQL or CSS, are formal languages that, unlike general-purpose host languages, are used for expressing the terms and problems of particular areas. They allow problems to be displayed in a more abstract form, and therefore domain specific languages (DSL) are often used together with general-purpose host languages.

Evaluation and further development of existing model-driven security frameworks.

Probably the most common way of embedding external DSLs inside the host language is representing DSL constructions as host-language strings, referred to as the string-embedded DSLs. The strings are often assembled dynamically using string concatenation and other string manipulation methods. While very flexible, such an embedding can be quite error-prone, as standard Java development tools provide no support for string-embedded DSLs.

This sub-project aims to develop new methods for analysing string-embedded DSLs, which support an early detection of malformed DSL constructs and other possible errors during string manipulations. To this end, strings representing SQL languages must be identified, some of which may be compounded from conditional sentences and cycles, as must potential errors. The challenge lies in accelerating these steps to run current analyses simultaneously with the programming. The solution will be designed as a plug-in in the Eclipse development environment.

Model-Driven Security. Despite the fact that the majority of cyber attacks target weaknesses in the enterprise application layer, security product development has concentrated mostly only on the network layer. This is one of the reasons why application security and the secure development process are gaining growing importance.

The aim of the model-driven security sub-project is to develop a model-based approach which focuses on security limits, while separating security logic, such as access control, from the rest of the business logic. The outcome of the project will be clearer application infrastructures and source codes that do not include access control elements or require the source codes to be changed when the access codes are changed. For the project to achieve its goal, existing model-driven security frameworks will be evaluated and developed further.

Conclusion

STACC has brought together around ten companies and two universities in extensive research projects in data analysis and software development. In less than six months, the Centre has established offices in Tartu and Tallinn and has launched and staffed several projects with around 30 researchers, engineers and programmers. STACC is open to any kind of joint research work with the public and private sectors.

3.2.5.
ELIKO'S PRIORITY AREAS IN DEVELOPING SMART SPACE TECHNOLOGIES AND SERVICES

INDREK RUISO
indrek.ruiso@eliko.ee
ELIKO Competence Centre
in Electronics, Info- and
Communication Technologies

ELIKO Competence Centre in Electronics, Info- and Communication Technologies[62] was established in 2004 as a company that conducts applied research in electronics, information and communications technologies. ELIKO mainly operates under the Estonian Competence Centre Programme and participates also in various EU research projects.

ELIKO has over twenty partners, such as Tallinn University of Technology, Regio AS, Artec Group OÜ, Põhja Eesti Regionaalhaigla (North Estonia Medical Centre), Ida-Tallinna Keskhaigla (East Tallinn Central Hospital), Girf OÜ, Apprise OÜ, Elvior OÜ, Modesat Communications OÜ, Smartdust Solutions OÜ, Smartimplant OÜ, Cybernetica AS, Testonica OÜ, and Mindstone OÜ to name a few.

The main area of activity is applied research in smart space technologies and services, in particular distributed sensing, RFID technologies and wireless communication, ontology-based information retrieval, formal decision methods, and dynamic personalised mobile applications.

By smart space technologies and services we mean automated equipment and networks (home electronics, security and medical equipment, etc.) that operate independently of humans by drawing information from the environment through sensors; that communicate with each other by exchanging information and algorithms; and that are adaptable to users' needs. For instance, a smart TV set does not require pre-programming of broadcasts, as it is able to independently choose and record broadcasts that may be of interest for the user.

ELIKO's future smart space technologies and serv-

Smart solutions have a great global market potential.

ices along with user profiles and decision-making software will be introduced for use at home, in the health system and public service provision. Smart solutions have a great global market potential with hundreds of millions potential users, which encourages companies to develop new personalised technologies and considerably increase their export potential.

Signal processing

ELIKO's main goal in signal processing is to develop effective broadband methods for faster, more precise and energy-saving conversion of analogue electrical signals into digital signals. ELIKO has filed eight patent applications in Estonia, Europe and in the USA since 2004. The main area of application has been bio-impedance measurement. For example, an eight-polar impedance meter has been developed jointly with Artec Group and SmartImplant for use in medical research to detect local myocardial ischemia. Tests are conducted by a US company St Jude Medical in Umeå, Sweden. ELIKO has also developed the Tissue Monitor, which allows post-operative monitoring of tissue transplants and which has already been put into use by SmartImplant.

Another area of application of impedance is the monitoring of structural changes and early detection of damage in major constructions like wind turbine blades. ELIKO participates in the international EU-ROSTARS Programme "Smart Embedded Sensor System for Structural Health Monitoring of Wind Turbine Blades"[63].

ELIKO has filed eight patent applications in Estonia, Europe and in the USA.

Electrochemical impedance measurement is another area with high future potential, as it allows to determine the actual capacity of batteries in order to optimise their load cycles and to notify of a breakdown and a need for intervention. This helps prolong the lifecycle of batteries and reduce the fall in capacity that results from ageing.

Future research areas are related to chirp signals (changes in the pulse repetition frequency of excitation signals). Chirp signals are used in medicine for early diagnosis of arteriosclerosis, ischemia and oedema (East Tallinn Central Hospital, North Estonia Medical Centre) and formation of measurement signals at sonars (Nordic Sonar).

Intelligent embedded systems

In the area of embedded systems, ELIKO is concentrated on ontology-based information retrieval and use of formal rules engines. The primary focus lies on bio- and environmental sensors and their wireless networks, but also flexible street lighting, for instance. While both research areas are generally related to global systems and

62   http://www.eliko.ee

63   http://www.sess-eurostars.eu

large computing capacity, then ELIKO is applying ontology-based communication and intelligence on common microcontrollers. To this end, ELIKO makes use of the know-how obtained from previous projects in RFID data formats, ad hoc communication networks, and joint projects with Roboswarm[64] implemented under the 6th Framework Programme of the European Union.

Together with Smardust Solution and Modesat Communication, ELIKO aims to speed up and increase the efficiency of data exchange in wireless sensor and communication networks.

Medicine entails great potential in terms of applying intelligent embedded systems. For example, home monitoring applications that are adaptable to individual patients would significantly reduce the expense of home nursing or telemonitoring, and allow earlier projection of health risks of the elderly. The adaptive home monitoring system is being developed by Girf OÜ and the East Tallinn Central Hospital. For the functionality of Smart Environment routers, ELIKO uses an improvement of the digital television receiver of Artec Group, which has been supplemented with various wireless LAN communication channels and a search engine software of ELIKO.

Ontology-based data mining and use of formal rules engines.

Research in semantic sensors is carried out also under the EUREKA programme ITEA2 by participating in the "Basic wireless sensor network platform extended by functionality with existing and emerging wireless platform" project.

Research in classical semantics is conducted under another international project entitled "Managing academic knowledge with integrated collaborative tools" (MAKINIT).

Personalisation and profiling

Applied research in software personalisation and user profiling is focused on developing a theory, methodology and tools for systems that provide personalised solutions to users, depending on their needs and individual situation, instead of universal ones. Areas of application include personalised recommendation systems of tourist attractions, mobile time tracking and medical information systems, and geoinformatics applications describing certain specific locations.

The recommendation system of tourist attractions takes into consideration the information available about the user (age, interests, time of visit, etc.) to give personalised recommendations on what and where to see and in what order. The mobile version of the system suggests new points of interest based on how the location of the user changes, and guides the user with maps and texts.

The majority of partners in that working group intend to put the results of that research area into use. For example, Regio AS is willing to improve their GPS positioning services, which are currently used by over 200 million people all over the world.

ELIKO has considerable experience in that field, as the company participates in the coordination of the Smartmuseum project under the 7th Framework Programme of the EU. In the course of the project, a personalised user interface for PDA was designed for museum visitors in Malta and Florence, Italy.

Personalisation is also used by ELIKO's partners Apprise in time tracking[65] and by Girf OÜ in a mobile hospital information system and home monitoring appliances that are currently under being developed.

Model-based testing

ELIKO has been using model-based testing already from its very first research projects. Model-based testing is about constructing a model-based representation of software under development to allow automatic generation of tests for that software, and this way considerably increase the efficiency of testing. The models for tested systems are designed with UML 2 modelling tools that allow to connect the developed testing devices with standard software development tools. As a result of research, tests for non-deterministic systems will be generated. These systems require tests that are essentially programmes, being generated online on a current basis. Compared to other online testing methods, the testing tools designed by ELIKO clearly stand out for higher efficiency.

UML 2 modelling tools allow to connect the developed testing devices with standard software development tools.

ELIKO has also participated in the D-MINT project under EUREKA ITEA 2, where it introduced a successful model-based testing of an embedded system on the example of a remote control application for city lighting in the City of Tartu, Estonia. For this and other exhibits of D-MINT, ITEA 2 was awarded Grand Prix at the annual fair.

ELIKO's partner Elvior uses the results of this applied research project in the development and improvement of its MessageMagic software.

The future plans of ELIKO include developing distributed testing methods and algorithms for easier and more efficient testing of mobile applications. The respective application will be designed by Regio AS for use it in its software products.

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64   http://www.roboswarm.eu

65   http://www.toggle.com

IV

Cyber security

4.1.
CERT-EE@2009

ANTO VELDRE
anto.veldre@cert.ee
Estonian Informatics Centre

The Department for Handling Information Security Incidents is a unit of the Estonian Informatics Centre and provides work for five people. In order to make it easier for foreign contacts to find us, the name CERT Estonia (CERT-EE)[66] is used in international communication. Below is a brief overview of the circle of problems that we encounter in our daily work.

In the eSociety, computer networks and their security play an entirely new role. It could be said that the functioning of the eSociety is fully based on the computer network. In case a connection is broken or an important nodal point gets damaged, the eState might fall in danger. The citizen can no longer manage his or her affairs in the habitual way (making card payments or bank transfers will be impossible and no information will be distributed through mass media) and if such a situation lasts for a longer time or becomes geographically widespread, the eSociety will stop functioning and there will be relapse to the traditional society, to an extent that

Computer networks and their security play an entirely new role in the eSociety.

is still possible. This is a comprehensive topic with a design and architectural aspect (how systems and networks are built), cyber security aspect (CIIP – Critical Information Infrastructure Protection) and an everyday "cockroach aspect" (keeping the well-known bugs off). Here is a clear analogy with an electrician, a dog-catcher or a bug exterminator. Figuratively speaking, the task of a CERT is to keep the virtual-biological diversity of one's network area within the norms or, to put it more simply, to fight against computer viruses, Trojan horses, worms, and just evil people in a way that ensures continuous functioning of the computer network.

We still remember the decade-old DDoS (Distributed Denial-of-Service) attacks and large-scale fraud attempts (e.g. the "ligupidamisega" phishing case in the Estonian financial sector in December 2001). Though companies, organisations and Internet service providers (ISPs) alike were targeted, they were not able to see

the attacks as a system. The IT security teams of Estonian financial institutions were the first to realise the scope of problems and their actual meaning in the context of future, and urged the Government of Estonia to establish, by 2006, its own CERT. Thanks to this, Estonia had the necessary capability by the time of cyber attacks of April 2007.

Nowadays, there is a lot of talk about terrorists though, in terms of cost, the real threat lies in regular criminals, who regard the anonymity of the Internet as an earning opportunity. The term *eCrime* refers to spammers, phishers, scammers, and developers of computer viruses. Though eCrime is targeted at the weakest link

eCrime forces the society to deal with security, privacy and safety problems.

of the chain (normally the home user), it affects the society at large, forcing it to deal with security, privacy and safety problems. A common name for all these risks is "maliciousness".

It is important to understand that the police will not disappear anywhere, and it will keep investigating crimes also in the eSociety (the eCrime investigators of the former Estonian Central Criminal Police are among the best even on global scale). However, there are certain tasks that cannot be performed by the police.

First, not every accessing attempt, outbreak of a computer virus or a scam constitutes a criminal offence. Second, in case of a murder the police conducts criminal proceedings and catches the murderer, but does not take away the corpse or wash up the scene. Third, the police cannot assume representative powers or take on the role of a statistician. Finally, the police will certainly not issue recommendations on how to improve a poorly built or weakly maintained information system.

The handling of incidents in the computer network is currently ISP-based. If an ISP does not meet the "hygienic requirements" and allows organised maliciousness to nest in its network, CERT has international means for detaching this ISP from the network. This is why ISPs are usually interested in keeping their reputation and tackling customer-related incidents as efficiently as possible. On international level, practice is evolving – and has already partly evolved – according to which en-

CERT-EE is an institution that represents Estonia in incident handling related communication with other countries.

tire incident-related information of a certain area, either a state or an ISP, is transferred through special channels to national CERTs.

CERT-EE is an institution that represents Estonia as a state and a society in incident handling related communication with other countries and foreign companies. It would be unthinkable that some tiny Estonian company

66   CERT – Computer Emergency Response Team

itself would contact, in case of an attack or a virus risk, the primary source of threat – today China, tomorrow Brazil. It is the task of a national CERT to know the legislation and traditions of its country, and to intermediate contacts in both ways as necessary. In addition, the national CERT knows exactly the status information on "maliciousness" in the state.

On one hand, CERT deals – just as its name refers – with response to objects and phenomena that are not yet of criminal nature (in case an incident is thought to evolve into a criminal case, CERT definitely advises the victim to turn to the police and gives guidance). On the other hand, CERT informs the society of Internet risks, while frequently these risks are not purely technical, but related to human behaviour. Very often there are parallel attacks against several organisations or companies. Companies might be willing to keep sad incidents like these to themselves, but the republic and society as a whole surely need to be informed of such hidden dangers – another activity area of CERT-EE.

Nowadays, we use terms like *cyber decency* and *computer hygiene.* Cyber decency denotes people's will to voluntarily follow the rules of the game (e.g. access Internet banks with as secure authentication means as possible) and report online threats (e.g. if somebody else's website has been defaced). On the state level, cyber decency rather stands for the level of safety; for instance, what is the chance of a private person to get infected with computer viruses when visiting the state's websites. Estonia's international reputation in the field is relatively good.

Nowadays, we use terms like cyber decency and computer hygiene.

Computer hygiene does not mean hand washing before placing them on the keyboard, but refers to a set of manners minimising online threats. In some respects, network threats are subject to the laws of nature – the wolf does not chase a healthy animal, but goes after a sick and exhausted game rather. From the computer user's point of view, already slightest bit of increased protection might be sufficient to drive the wolf away so as to chase in other, more convenient places. To express the same idea in other words: for the most part, one does not need to be as fast as to flee from a bear, but just to be quicker than one's friend.

In 2009, CERT-EE organised, with the assistance of the EU Structural Funds, an information campaign for parents, in particular for mothers, to explain the main online risks and offer recipes for avoiding them. The campaign included a TV advertisement, a playground event and informative lessons for children and teachers at school. Material of longer lasting value was gathered on a relevant website[67]. Coordination of the work of in-

formation security specialists is another important area for CERT Estonia. To this end, a special wiki, a closed chat room and annual meetings in Voore are used.

CERT-EE deals with technical analysis of the network layer. For instance, there exist "honey-pot" like technical solutions that look like poorly maintained home PCs, which malware continuously attempt to access. Naturally, they do not succeed in gaining access, but if information on the same burglar is received from ten different "honey pots", this can be considered an intended attack. In such cases CERT Estonia contacts the administrator of the relevant IP-address either in Estonia or abroad. These are usually cases, where a home PC is spreading malware and the CERT's "intelligence information" allows ISPs to recommend different "cure methods" to their customers. As an Estonian contact point, CERT-EE receives "honey pot" information also from abroad and forwards this to relevant service providers. "Maliciousness information" is naturally forwarded also in the opposite direction, requesting, through a CERT of some other country, to clean an infected computer abroad so that it would stop attacking Estonian networks.

A considerable part of CERT-EE's work is related to public relations and communication.

A considerable part of CERT-EE's work is related to public relations and communication. The Bronze Night[68] and related cyber attacks took place already three years ago, but are still well remembered, putting small Estonia on the world map and raising the subject of cyber attacks against a country over and over again. However, we would rather not promote an image of Estonia as of a tiny victim, but have also much more positive messages, including about our eSociety and the national ID card for personal identification. In 2009, several large-scale projects were launched to strengthen our national capability and develop Estonia in a positive way.

The ability to recognise online risks and discover viruses in state agencies.

A project AbuseHelper is, in essence, a huge machine for the processing of telegrams. The system collects, from all over the world, all claims and opinions about malicious IP addresses in Estonia, sorts them according to Estonian service providers, and forwards the claims to relevant ISPs. Estonia used to have a similar information processing system also earlier, but the new one is more powerful and with greater scalability. By giving the outcome for use as free software for all CERTs in the world, Estonia hopes to save up from further maintenance and development costs of the system.

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67   http://www.netiohud.ee (in Estonian only)

68   Also known as the April Unrest, referring to the riots surrounding the relocation of the Bronze Soldier, the Soviet World War II memorial, in Tallinn in April 2007.

A project called Snort for All (S4A) will provide an instrument for recognising online risks and discover viruses in many state agencies. The peculiarity of the system lies in its capability to search maliciousness, in addition to what is sought by antivirus, also from the network layer. It other words, the system allows an agency or an organisation to recognise a virus, worm or a pandemic already in its initial phase. At the same time, there will be better understanding that stories about viruses and worms do not fall into the world of fantasy, but rather constitute an everyday reality. In essence, the S4A is a magnifying class assisting the local administrator to notice attacks that have been declared dangerous by CERT-EE.

Finally, a couple of words about CERT-EE's most ambitious project entitled Virtual Situation Room (VIRTS).

Developing an IT system to contribute to the management of critical infrastructure emergencies.

CERT-EE and its partners plan to develop, in support of Estonia's recently adopted Emergency Act, an IT system which would contribute to the management of critical infrastructure emergencies. This means there will be sensors at various service providers registering abnormal situations, such as broken communications and power failures. The database will contain information on the severity of lost or interrupted services. The system will be constantly calculating graphs mirroring the work of critical services (green/red, existing/missing). In essence, this is one of the first attempts in the world to develop an expert system that will calculate, based on hundreds of dispersed parameters, whether the status of infrastructure important for the state and society is critical or not, and will alarm, if necessary, responsible persons. Plans for 2010 include carrying out a training simulation, where crisis managers and managers of emergencies make decisions based on an IT system.

4.2.
AUDITING OF DATABASES FIVE YEARS AFTER THE IMPLEMENTATION OF THE INFORMATION SECURITY STANDARD ISKE

DANIEL TIKKERBÄR
daniel.tikkerbar@focusit.ee

MARTIN LUTS
martin.luts@focusit.ee
FocusIT OÜ

Different databases contain an ample quantity of data the security of which needs to be ensured alongside with guaranteeing their administration and usability. Therefore, a decision was made in Estonia in 2004 to implement an information security standard ISKE so as to ensure sufficient level of security for data processed in information systems. The objective of this article is to analyse the results of audits on the implementation of the standard and give an overview, from the viewpoint of a certified CISA[69] auditor, of best practice that has become evident in the course of auditing the databases. The article will not deal with the essence of the three-level baseline security standard, as such information has been covered on the website of the Estonian Informatics Centre[70] and in an article "ISKE: the information security standard for eGovernment"[71] written by Toomas Viira.

Implementation of ISKE: state of affairs

The three-level baseline protection system for information systems[72] has been developed primarily for ensur-

69   CISA – an internationally recognized certificate for Certified Information Systems Auditor, issued by ISACA (Information Systems Audit and Control Association) since 1978
http://www.isaca.org/cisa/

70   http://www.ria.ee/iske/

71   http://www.riso.ee/en/files/Yearbook2008/html/Yearbook.html#

72   ISKE is based on the information security standard IT Baseline Protection Manual (IT Grundschutz-Katalog) issued by the German Federal Office for Information Security (BSI)

ing the security of information systems and related information assets used for the maintenance of state and local government databases. ISKE can also be used by companies for ensuring the security of their information assets. As the name of ISKE – three-level baseline protection system – suggests, the essence of the standard lies in the division of data based on three security levels: low (L), medium (M) and high (H). The appropriate level of security is determined on the basis of security classes – confidentiality, integrity and availability. Security classes are assigned based on legislation and contracts, main activity or business processes, and requirements arising from the severity of consequences (of a security incident).

The first version of the implementation guide of ISKE was completed in October 2003. The document gives an overview of the essence of ISKE and provides guidance for the specification and security analysis of information assets, including determination of security levels, security classes and security measures. For the administrator of a database, the document is an invaluable guiding material for the implementation of ISKE. In each new version of the guide, catalogues and security specifications are updated. Since the last version,

The implementation of ISKE is compulsory for most of the 450 databases and information systems in RIHA.

ISKE catalogues – a part containing descriptions of modules, measures and threats – has been separated from the implementation guide, but as an appendix, it constitutes an inseparable part of it. By the end of 2009, version 5.00 of the ISKE implementation guide was completed.

In addition to the implementation guide, an ISKE tool, a useful auxiliary material for the implementation of ISKE in an organisation, can be downloaded from the website of the Estonian Informatics Centre (RIA)[73]. By January 2010, Version 1.0.2 was completed; its future amendments will definitely further increase its functionality and the tool will be taken into wider use. In summer 2009, RIA also completed a guide on information security[74], which gives a solid overview of most important IT security measures and is targeted primarily at IT managers and information security managers in state agencies and SMEs. The guide can also be used by managements of agencies in order to obtain an overview of most significant information security measures and evaluate the situation in their own agency.

At the end of 2009, the administration system of the state information system (RIHA) contained data about 450 databases and information systems of different status. For most databases registered in RIHA, implemen-

73 http://www.ria.ee/isketooriist (in Estonian only)

74 http://www.ria.ee/27483 (in Estonian only)
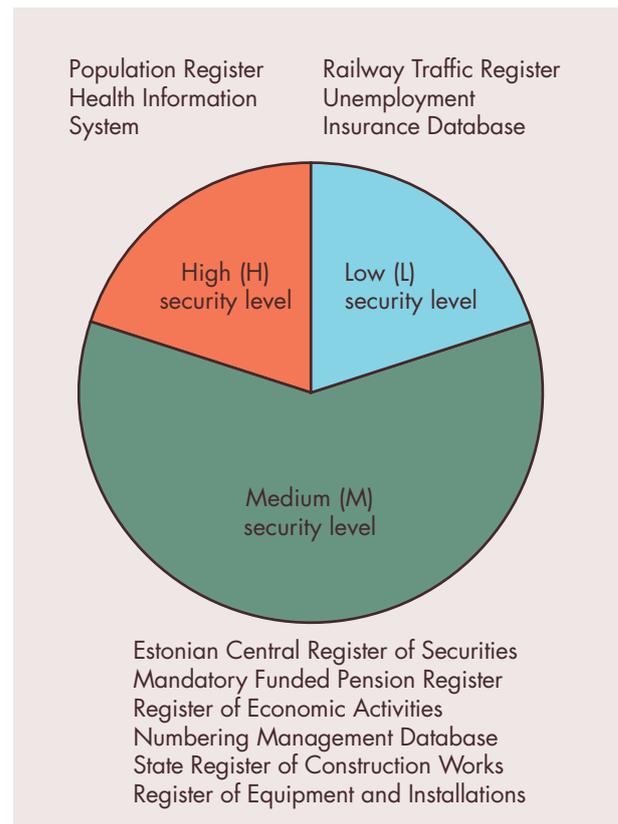
FIGURE 1. Databases having passed ISKE audit
Data from RIHA as at mid-January 2010

tation of ISKE is compulsory. By mid-January 2010, ten databases in RIHA were marked as audited (see Figure 1), of which eight (including an H-level database) contained comments and recommendations, while two did not have any. There were a total of 67 databases registered in RIHA in case of which ISKE had been implemented but not audited, of which only five were H-level databases. None of the databases had been marked as "implemented", "audited" or "did not pass the audit". The audit of a database can be considered passed if it is marked as audited without comments and recommendations or audited with comments and recommendations. Auditor's comments and recommendations can be of varying weight; depending on their nature and based on the willingness of an agency being audited to improve the situation, an audit can usually be considered as passed with comments of medium weight. In case there are many comments and recommendations or these are of critical weight, a database cannot pass the audit.

Requirements for auditing the implementation of ISKE

Chief processors of databases belonging to the state information system must conduct a regular independent audit on the implementation of the system of security measures. Audits of local government databases are commissioned by the Ministry of Economic Affairs and Communications, taking into account the terms and re-

quirements laid down in ISKE regulation[75] and proceeding from the needs.

The aim of the ISKE audit is to give an independent evaluation on whether ISKE security measures have been implemented in accordance with the requirements of the standard. For the administrator of a database the audit gives confirmation that the organisation of its security measures complies with the practice of the baseline protection standard and risks related to the administration of data are systematically managed. The obligation to conduct audits on the implementation of ISKE is set out in a relevant regulation, which establishes, among other things, requirements for auditors and the frequency of conducting audits. In January 2010, RIA published the first version of a guide for the auditing of ISKE[76], which specifies aspects that have not been provided for in the above-mentioned regulation and gives additional guidance for the commissioning and implementation of audit.

> *The audit aims to give an independent evaluation on whether ISKE security measures have been implemented in accordance with the requirements of the standard.*

The auditor must have, at the time of conducting the audit, one of the following certificates: a valid Certified Information Systems Auditor (CISA) certificate, issued by the Information Systems Audit and Control Association; a valid ISO 27001 Lead Auditor's certificate, issued by the British Standards Institute; or a valid certificate of an ISO 27001 auditor certified on the basis of IT Grundschutz, issued by the German Information Security Agency[77]. A list of companies dealing with ISKE audits[78] as well as a list of auditors with CISA certificates[79] are published on the website of the Union of Estonian Information Systems Auditors.

Audits are commissioned by chief processors of databases. Pursuant to the Databases Act, the chief processor of a database is a representative of the owner of a state or local government database, who is responsible for the legality of the maintenance of the database, arranges the performance and acceptance of the work necessary for the design and introduction of databases or parts thereof, directs the maintenance of the database, and exercises supervision over the maintenance of the database. The chief processor of a database with security level H must conduct an independent audit on the implementation of the system of security measures

in every two years, databases with security level M in every three years and those with security level L in every four years.

The regulation also sets out, based on security level, first deadlines for the auditing: the chief processor of a database with security class H is obliged to conduct the first audit of implementation of the system of security measures by 1 March 2010, databases with security class M by the end of 2010 and those with security class L by March 2011. In this context, it has to be mentioned that leaving the auditing till the last minute might lead to a situation, where timely audit is impossible due to lack of auditors. Increase of demand also raises the price of audit for the chief processor.

The chief processor of a database must submit, within one month after the completion of the audit, auditor's report through RIHA. It is, however, possible that not all administrators of databases have updated the status update on ISKE of their databases yet. At present, no direct incentives are known to exist – neither direct benefits for the entering of data nor sanctions for the neglect thereof. Respective supervision from the state, however, would require additional resources.

> *The chief processor of a database must submit, within one month after the completion of the audit, auditor's report through RIHA.*

Database auditing: practice

Based on the experience, the amount of time spent on an ISKE audit is, depending on the specifics of a database, approximately 70-100 hours. The chief or authorised processor of a database commissioning the audit should be ready to contribute 20-40 additional hours of its own time, which primarily consists of searching and finding documentation, participating in interviews, responding to additional questions, enabling the testing etc. The auditor analyses the conformity of information assets inventory to ISKE requirements, adequacy of determining the security classes, and relevance of modules and measures to be implemented. The most time-consuming part both for the auditor and the customer is evaluating the status of implementation of security measures. At the end of the audit, additional risks are evaluated.

The cooperation between the auditor and the representative of the customer will be smoothest if the customer has implemented ISKE according to the recommendations of the ISKE implementation guide and when relevant processes are sufficiently organised and documented. The representative of the customer does not need to have ICT background, though this would definitely simplify communication. It is important that the customer and, thereby, also the auditor understand the relevance and background of information security

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75   Government of the Republic Regulation No. 252 of 20 December 2007 on System of Security Measures for Information Systems

76   http://www.ria.ee/27483 (in Estonian only)

77   Bundesamt für Sicherheit in der Informationstechnik

78   http://www.eisay.ee/3114 (in Estonian only)

79   http://www.eisay.ee/166 (in Estonian only)

related decisions that have been made in the framework of ISKE implementation.

- As it often happens that the chief processor of a database realises the importance of the audit without really understanding preparedness for it, a relevant check-list has been developed. Does information security related documentation exist and, if so, which kind?
- Has an inventory of information security assets been carried out in accordance with requirements set out in the implementation guide of ISKE? Which relevant materials there exist?
- Has a chief user been assigned to the database?
- Has an analysis based on ISKE guide (legislation, main processes, severity of consequences) been carried out in order to determine security sub-classes? Which relevant materials there exist about the process?
- Have security measures been selected based on requirements of the ISKE implementation guide? Which relevant materials there exist?

Responses to these questions should be compared to the requirements of the ISKE implementation guide for documentation and activities. In case the preconditions have not been met, ISKE implementation should be started with.

Relation between ISKE implementation and future audits

Depending on the specifics and complicacy of a database and based on an organisation's know-how, the implementation of ISKE might be accomplishable for the agency or enterprise itself. However, it might turn out to be necessary to involve an external consultant – either in one, several or all stages. While for the auditing of ISKE the auditor must have a valid CISA, ISO or BSI certificate, this is not obligatory for the implementation project. However, having an auditor in the implementation team, who observes the stages and results of the implementation process through an auditor's point of view already from the initial phase, will certainly contribute to the likelihood of passing the audit successfully. At this point, it is important to refer to the requirement of independence of auditors – a person having consulted an agency in the field to be audited during the two previous years may not serve as an auditor for that institution.

A check-list to identify the preparedness of the chief processor of a database for an audit.

It is extremely difficult to state a general time needed for the implementation of ISKE, as this depends, to a great extent, on the complicacy and specifics of a database and on the customer's personnel contributing to the process. Based on practice and in very broad terms, the implementation of ISKE of an average database takes approximately 400 man-hours. This time is divided between the employees of an agency or an enterprise and the potential external consultant. The division of time depends on the nature of work, but according to previous practice, it is usually half-and-half. However, this calculation does not include time necessary for the implementation of non-implemented and partly implemented measures (only planning of it has been taken into account). Here, it is important to note that an audit can be passed without critical comments even if a measure has not yet been implemented. However, a detailed implementation plan with deadlines and approved budget for it must have been compiled.

To conclude, it can be said that the implementation of ISKE in state databases is a voluminous and time-consuming process. However, considering that the process started in 2004, the share of databases in RIHA that have been audited on time is still rather low. Regular auditing of security measures of databases and information systems ensures the administration and protection of their data. Ensuring the security of information assets also needs to be organised in enterprises and this activity in the private sector can neither be over- nor underestimated as compared to the public sector. ISKE is a standardised, state-established and widely accepted way for ensuring the security of information systems and related information assets.

V

International cooperation on information society issues

5.1.
EGOVERNANCE ACADEMY IN 2009

ARVO OTT
arvo.ott@ega.ee
eGovernance Academy

Since 2002 the main objectives of the eGovernance Academy include analysis of Estonia's experience in the field of eGovernment, provision of research and consultations in that area and introduction of the best practice of Estonia and also the European Union to the developers of eGovernance in other countries. In previous years the focus was on introducing eGovernance and electronic services, whereas in 2009 the focus shifted to eDemocracy. eDemocracy has been constantly gaining ground in Estonia, which is, for instance, reflected in the increasing popularity of iVoting. At the same time, global interest in that area has also grown rapidly, and so has Estonia's reputation. Notably, Estonia ranked eighth among 134 countries in the World Economic Forum Global IT Report in terms of the inclusion index. Estonia has received high rankings also in different eGovernment categories. The same report places Estonia on the third position for the development of eGovernment and on the top position for eGovernment services. This has raised further interest in the principles and applications adopted in Estonia, and has brought numerous high-level delegations to Estonia and presentations in international eGovernment conferences. Among others, visitors in Estonia and the eGovernance Academy have included parliament members from Austria, Sweden and Finland, ministers responsible for eGovernment in Croatia and Kosovo, and top eGovernment leaders from India and Serbia.

The focus of introducing eGovernance has shifted to eDemocracy.

The year 2009 witnessed a number of exciting surveys, such as the development of a white paper of the Estonian IT development strategy or a broader analysis of carried out at the end of the year, which comprised also other business areas. The eGovernance Academy developed a draft eGovernment Interoperability Framework for Albania, and also organised training and consultations on the Albanian eGovernment framework, electronic records management and archiving, methods for training eGovernment officials, and other similar areas.

Other interesting preparatory works of the Academy were related to establishing an eGovernance Academy in Ghana and in the science park of Tunisia, and introducing Estonia's experience in China, Japan, Vietnam, Colombia and Montenegro, to name a few.

In 2009, the eGovernance Academy organised different trainings to government officials in Kosovo, Serbia, Haiti, Azerbaijan and Palestine, and to representatives from ministries and members of parliament in Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan. The projects in Haiti and Azerbaijan are supported under the East-East: Partnership Beyond Borders programme of the Open Estonian Foundation, which in addition to training in Tallinn also sets out provision of on-site know-how by Estonian experts.

For the third year in row the eGovernance Academy organised the fourth module of an International Master Programme on eGovernance of the Technical University of Lausanne, Switzerland, with participants primarily from African countries.[80]

Shorter visits to the eGovernance Academy were made by officials from Kosovo, Belarus and India as well as journalists from major dailies in France.

The Academy cooperates closely with the Estonian Ministry of Foreign Affairs, the Ministry of Economic Affairs and Communications, and other public sector agencies. The Academy's role in promoting business contacts and in preparing multi-sectoral cooperation projects in technology has considerably grown. The Academy highly values its long-term partners: the UNDP, the Open Society Institute, the World Bank, the Technical University of Lausanne, and others.

In conclusion we may say that the importance of information society and eGovernance is constantly growing, even though developments and active work have been made in that area for over ten years already. A number of countries has set the development of eGovernance a priority, in particular developing countries who see the opportunities that eGovernance provides for catching up with the advanced economies and for enhancing economic efficiency. At the same time, top leaders that are closely related to information society development are often not aware of the field and do not acknowledge their role in supporting the development. Many believe that eGovernance is just a matter of technology. Therefore, it is the primary mission and purpose of the eGovernance Academy to dispel this belief by supporting general eGovernment developments and raising awareness of eGovernance at all levels.

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80 For further information see http://egov.epfl.ch/webdav/site/egov/shared/egov/files/EPFL_e-Governance_Brochure