

Lithuanian eGovernment Interoperability Model

Rimantas Gatautis¹, Genadijus Kulvietis², Elena Vitkauskaite¹

¹Kaunas University of Technology

K. Donelaicio str. 73, LT-44029 Kaunas, rgataut@ktu.lt, elevitk@ktu.lt

²Vilnius Gediminas Technical University

Sauletekio av. 11, LT-10223 Vilnius, gk@fm.vgtu.lt

Interoperability issues are widely discussed not only within business community, but more constantly between public administration representatives. An eGovernment Interoperability Framework (eGIF) is one way to achieve eGovernment interoperability. An eGIF is a set of standards and guidelines that a government uses to specify the preferred way that its agencies, citizens and partners interact with each other. eGIF includes: "... the basic technical specifications that all agencies relevant to the eGovernment strategy implementation should adopt". eGovernment Interoperability Frameworks appear as the governmental policy cornerstones for deploying joined-up information systems and providing one-stop services to citizens and businesses.

Lack of interoperability is due to a number of factors. It may be due to policy reasons. Privacy, particularly as it relates to personal health information and national security, are good examples.

Lack of interoperability also has to do with the heterogeneous nature of government information systems – the result of past decisions regarding hardware, software, and legacy systems. There is also the "turf" issue – various agencies want their own systems and are worried about sharing data and/or common services. Lastly, the network effect of some companies that use proprietary standards have helped create some of the current problems.

Many governments did not know they had a choice, nor were they aware of the long-term effects of their procurements. Thus, to achieve interoperability, there needs to be a desire for transformation and the cooperation of the various agencies of government. Unless commitment to achieving interoperability is demonstrated at the highest levels, a plethora of policies, as well as bureaucratic and narrowly construed corporate interests can always be used to challenge efforts to make interoperability happen.

In order to come up to the expectations of their stakeholders and to achieve real resolution of the evolving interoperability problems, the scope of the eGIFs needs to be extended, including service composition and discovery, development and management of semantic schemas for governmental documents, certification mechanisms and authentication standards. Moreover, a shift from a paper-based specification towards a repository of services, data schemas and process models is needed, in order to serve

the ever-changing nature of governments under transformation. Upon conducting a state of the art analysis of relevant frameworks at a pan-European and national level, lessons learnt from the pioneers UK eGIF, German SAGA and Greek eGIF are presented. The proposed Lithuanian eGIF model describes new approach outlines the technical, semantic and organization dimensions and stresses the importance of political interoperability. It also provides three layers model moving from only standards and specifications based approach to systems and coordination support elements. Finally the paper tackles the issues that rose within stakeholders' community in the eGovernment interoperability context.

Keywords: *eGovernment, interoperability, interoperability framework, key success factors.*

Introduction

Electronic government (eGovernment) interoperability is becoming an increasingly crucial issue, especially for developing countries that have committed to the achievement of the Millennium Development Goals by 2015. Enhanced government efficiency and effectiveness coupled with the delivery of basic public services to all citizens are essential components required to achieve such goals. To date, most governments have finalized the design of national eGovernment strategies and are busy implementing priority programmes (Janssen and Scholl, 2007).

However, these technology investments have not led to more effective public eServices (Skietrys, Raipa, Bartkus, 2008), but increased citizens expectations that public sector organisations will provide services similar to those in the commercial sector with the same effectiveness and efficiency (Kasubiene & Vanagas, 2007; Kazeminkaitiene and Bilevicienė, 2008). On the contrary, in many cases, they have ended up reinforcing old barriers that made access to public services cumbersome – not to mention expedient decision-making processes. The eGovernment promise of more efficient and effective government institutions is not being fulfilled due, to a large extent, to the seemingly ad hoc deployment of information communication technology (ICT) systems (Gatautis, 2008). In the short run, these ad hoc deployments address the specific needs of government agencies, but they do not pay the required attention to the overall need of interaction

among the diverse ICT systems in order to share and exchange data (Damaskopoulos, Gatautis, Vitkauskaitė, 2008). This collaboration is a function that is the key, for example, in eGovernment “one-stop shops” that aggregate many public services into one service window (Charalabidis, Tschichholz and Hopkirk, 2007).

Furthermore, the seamless flow of information across government and between government and citizens also increases transparency and accountability. Governments are thus better able to justify their programmes while citizens are better informed – all prerequisites for a vibrant democracy.

Today, far too often, the data needed by policy makers to make better decisions is available but inaccessible. Policy makers are faced not only with overlapping and uncoordinated data sources, but also with the absence of common terms of reference and means of representing these data. This results in the time consuming and complex cost of comparing data that is represented differently. Interoperability will allow data compiled by different agencies to be used together to make faster and better decisions. An important goal of governance is to enable the citizenry to have easier and faster access to government information and services. The seamless flow of data from one government office to another provides the policy maker with the information needed to draft sound policy and deliver better services (Müller, 2006).

Providing one-stop comprehensive services to citizens and businesses requires interoperability since government services are diverse and are offered by different agencies. Furthermore, increasing the ease at which information is shared among individual agencies (up to the point allowed by law) makes for better and/or new services. For instance, health services can be delivered faster and become more convenient to citizens if public hospitals are interconnected with health insurance agencies. The administration of justice would be faster and more effective if the information systems of various agencies under the criminal justice system (police, public prosecutors, public attorneys, courts, prisons) could share data.

Interoperability allows governments to manage their internal operations better (Charalabidis et al., 2007; Tambouris, Tarabanis, Peristeras and Liotas, 2006; Scholl, 2005). Governments can interchange or substitute one piece of software from one provider for another without having to buy more hardware and software and/or introduce new systems.

Finally, interoperability also promotes international cooperation. Interoperability among governments, also known as inter-government interoperability, can help create the infrastructures necessary to solve cross-border problems such as drug trafficking, environmental pollution, money laundering, and illegal arms trafficking (Maslen, 2005). Interoperability among governments can also encourage delivery of eGovernment services to citizens and businesses across a region and facilitate trade between a group of countries and their trading partners.

Considering the above-mentioned reasons, *the object of the research* is the interoperability of eGovernment.

The objective of the research is to analyze interoperability conceptions and constraints of interoperability achievement, to compare best practice in European Union achieving

eGovernment interoperability and to discuss Lithuanian eGovernment interoperability framework.

The methods of research are systemic, logic and comparable analysis.

Interoperability conception

According to T. M. Egyedi (2007), interoperability can be examined in different aspects of understanding its framework, concerning physical, empirical, syntactical, semantic, pragmatic, and social layers (Dzemydiene, Maskeliunas and Dzemyda, 2008). Interoperability of computer system is defined by Institute of Electrical and Electronics Engineers (2001) as “the ability of two or more systems or components to exchange information and to use the information that has been exchanged”. Electronic dictionaries define interoperability as “the ability of software and hardware on multiple machines from multiple vendors to communicate”. We define interoperability as: *The ability of distinct systems to communicate and share semantically compatible information, perform compatible transactions, and interact in ways that support compatible business processes to enable their users to perform desired tasks.* (Rothenberg, Botterman, and van Oranje-Nassau, 2008) Although our definition of interoperability was derived from a technical perspective, it applies to all aspects of eGovernment, if “system” is interpreted broadly. Note that this broad definition implies that an IF is far more than just a list of recommended standards.

From the early days of eGovernment, interoperability was perceived as a critical challenge and enabler. Interoperability has a central role in eGovernment and as a result significant work has been already conducted. Since 1991, interoperability has remained an important EU goal – especially in the eGovernment context. To take one particularly pertinent example, in June 2002 the eEurope 2005 Action Plan made the development of a European Interoperability Framework (EIF) a priority component of pan-European eGovernment strategy (Müller, 2006).

Nowadays research emphasis is shifting to the coordination of web services invocations, thus from enhancing interoperability at the data exchange level to the business process level (Zhao and Cheng, 2005).

Broad-based ICT interoperability is vital to the fulfilment of the Information Society’s enormous potential to enrich the lives of citizens in Europe and beyond. Interoperability plays this role by ensuring that consumers have the ability to access and use a diverse range of technology products and services. Interoperable products provide consumers with meaningful choice among vendors, as well as with increased functionality, enabling consumers to construct systems that meet their specific needs from a variety of vendors, incorporating hardware (microprocessors, memory and storage media, printers, screens, etc.), software elements (operating systems, middleware, data management tools, applications etc) and related services (Charalabidis et al., 2007). In this way, interoperability reduces ICT integration costs, improves efficiencies, enhances business productivity and facilitates the adoption of new and emerging technologies. This also helps to create more favourable environment for other processes such as eBusiness, eHealth development (Gatautis, Gudauskas, 2006).

Critical success factors of interoperability

Interoperability key factors come in many guises: privacy, ambiguity about statutory authority, openness to public scrutiny, trust, lack of experience, hardware/software incompatibility, data sharing standards, a lack of awareness of opportunities to share, or even unwillingness to share information or integrate processes.

The eGovernment interoperability key factors are organised as related to (Tambouris et al, 2007):

- technical interoperability;
- semantic interoperability;
- organisational interoperability;
- interoperability governance.

Technical interoperability here refers to all the technological key instruments for offering integrated public electronic services. There are two groups of these:

- *Core technical* interoperability: this covers all technical issues that lie at the core of information interchange and/or seamless distributed process execution (e.g. understanding the data syntax and/or semantics);
- *Supportive technical* interoperability: this covers broader technical issues that although are common in almost all information systems implementations, become more challenging and difficult to handle in environments where interoperation is required (e.g. availability).

Semantic interoperability (excluding technology) is directly or indirectly related to the development of commonly agreed descriptions (e.g. meta-models, common definitions and vocabularies, content standards, ontologies) for public administration related information. Taking into account this finding, we group the identified key factors, in three categories with regard to the lifecycle of common definitions development, that is:

1. drafting/agreeing on the common definitions/vocabularies/metadata etc;
2. using/exploiting these common definitions;
3. maintaining/evolving common definitions.

Following the lifecycle of these common definitions, we noticed that there are no large scale real world implementations with documented experience for the three stages presented above, apparently due to the novelty of the overall semantic interoperability field and the limited experience public administration organisations have in setting up applications that support semantic interoperability (Tambouris et al., 2007). Thus, the experiences we have found were mainly related to the process of agreeing/drafting, less on using and scarcely on maintaining and updating common definitions and standards.

The following semantic interoperability key factors have been identified and further presented below (Gujarro, 2007):

1. With regard to drafting/agreeing on the common definitions/vocabularies/metadata etc.:
 - Wide commitment and high support to develop common/global definitions and representations for eGovernment semantics.
 - Modelling perspective and formalism for documenting the common definitions.

- Administrative level of definitions development.
2. With regard to using/exploiting common definitions:
 - promotion/dissemination and the maturity of common definitions;
 - trust, reliability and the supportive technical IOP layer;
 3. With regard to maintaining/evolving common definitions:
 - Maintenance and evolution of common definitions
- Organisational interoperability is concerned with "... defining business processes and bringing about the collaboration of administrations that wish to exchange information and may have different internal structures and processes, as well as aspects related to requirements of the user community." Obviously the focus here is on the cross-organisational services and their users (Charalabidis et al., 2007).

Taking into account this definition, the following key factors related to *organisational* interoperability have been identified by Modinis study (Tambouris et al., 2007):

- Clear link between cross-organisational processes/services and the business strategies of the broader agencies.
- Modelling and visualisation of public administration services/processes.
- Involvement of the users by setting up communities of practice in the process of new service design.
- Reuse of knowledge and experience related to the execution of internal and cross-agency business processes/services from the private sector.
- Identification and documentation of common service functionality and features across public administration agencies.
- Support of multi-channel service delivery.
- Consensus on and visibility of the ownership, management and responsibility for cross-organisational processes/services.

Along the first dimensions, four types of key factors for interoperability governance might be introduced (Tambouris et al., 2007):

- **Political:** factors that are related to broader policy and institutional issues and should be addressed by political personnel.
- **Legal:** factors that need legal action.
- **Managerial:** factors that pertain to organisational, managerial and technology related (e.g. decisions on technologies to be used) issues and should be dealt with by public administration professionals and managers.
- **Economic:** factors related to financing and budgeting.

Political Key Factors. These are issues that should be dealt with basically at the political level. There are identified three interoperability key factors grouped under the *Political* category. These are:

- Development of national eGovernment interoperability strategy and programmes.
- Promotion of organisational federalism as a model for organising the divergent administrative space into a cooperative environment.
- Significance of international interoperability aspects.

It should be mentioned that the first factor is broad enough to involve a broader community and not just political personnel as it reveals important organisational and financial aspects.

Legal Key Factors. There are important key factors related to legislation that should be taken into account when drafting, promoting or implementing eGovernment interoperability projects. The following deserve particular attention:

- legal alignment;
- intellectual properties;
- diffusion of digital signature and electronic identity;
- citizen privacy and data protection.

Managerial Key Factors. In this category, we have grouped the following key factors:

- Clear interoperability leadership/ownership/ sponsorship/ management.
- Flexibility/transferability/reconfigurability of the interoperability solutions proposed by specific projects.
- Adoption of Standards.
- Broad commitment, participation and communication.
- Staff Training.
- Willingness for cultural change at all partners.

There is a certain set of *economic key factors* related to local and regional interoperability. These are:

- Adoption/switching costs inherent to interoperability solutions.
- Public procurement and financing.
- Risks for early adopters.
- Partnering with the private sector.

eGovernment Interoperability framework and principles

A Government Interoperability Framework (GIF) is one way to achieve eGovernment interoperability. A GIF is a set of standards and guidelines that a government uses to specify the preferred way that its agencies, citizens and partners interact with each other. As noted by L. Guijarro (2007), a GIF includes: "... the basic technical specifications that all agencies relevant to the eGovernment strategy implementation should adopt."

A GIF normally includes:

- context;
- technical content;
- process documentation; and
- implementation and compliance regimes.

Principles indicate the priorities of government in terms of ICT development. These principles guide the development of the GIF and become the criteria for choosing standards. Many of the GIFs recognized seven similar key principles as described below:

- *Interoperability* – guaranteeing a media-consistent flow of information between citizens, business, the federal government and its partners and selecting only those specifications that are relevant to systems' interconnectivity, data integration, eServices access and content.
- *Scalability* – ensuring the usability, adaptability and responsiveness of applications as requirements

change and demands fluctuate.

- *Reusability* – establishing processes and standards for similar procedures when providing services and defining data structures and that consider the solutions of exchange partners that one has to communicate with, leading to bilateral solutions and agreements.
- *Openness* – focusing on open standards; that is, all standards and guidelines must conform to open standards principles. Wherever possible, open standards will be adopted while establishing technical specifications. Standards that are vendor- and product-neutral should be considered in favour of their proprietary alternatives.
- *Market support* – drawing on established standards, recognizing opportunities provided by ICT industry trends, and broadening the choice among suppliers.
- *Security* – ensuring reliable exchange of information that can take place in conformity with an established security policy.
- *Privacy* – guaranteeing the privacy of information in regard to citizens, business and government organizations, and to respect and enforce the legally defined restrictions on access to and dissemination of information, and ensuring that services need to endure.

eGovernment Interoperability Frameworks in Europe

Because eGovernment interoperability frameworks are still a relatively new concept, there are not yet many examples to choose from, and most of those that exist appear to be well known.

According to L. Guijarro (2009) interoperability frameworks in Europe have shown up as a key tool for interoperability in the deployment of eGovernment services, both at national and at European level. They are initially focused on technical interoperability, but recently inclusion of semantic in the interoperability frameworks started.

Nowadays, building an eGovernment Interoperability Framework must oppose the tendency to "reinvent the wheel" and requires examination and extended review of related research and standardization efforts (Guijarro, 2007) in the EU, the UK, Germany, Greece and other EU countries (see Figure 1).

This paper presents comparison of the best practice in implementation of eGovernment interoperability frameworks according certain criteria in following countries:

- At European level, the European Interoperability Framework – EIF (Version 1.0) (IDABC, 2004, 2008).
- e-Government Interoperability Framework of United Kingdom. (Cabinet Office, 2005)
- Germany's Standards and Architectures for e-Government Applications (SAGA) Version 3.0. (KBSt, 2006)
- Greece and its new Greek e-Government Service Provision and Interoperability Framework (The Greek eGIF, 2008).

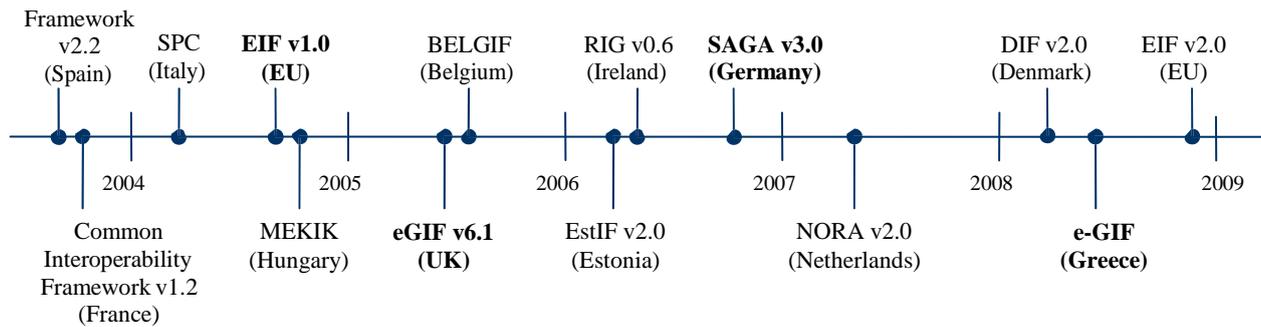


Figure 1. eGIFs in European Union

Despite being small, this sample provides a good mix of national and EU efforts. The specific rationales for our choices were as follows. The EU EIF was a given, since it provides an overarching set of interoperability criteria (the IDABC Architecture Guidelines (2004) provide a related architectural perspective). Most national interoperability frameworks refer to the EIF as well and strive for at least partial compliance with it. The UK's eGIF is one of the most mature (in the sense of having been around longest and having been through the most revisions) and complete of the national interoperability frameworks and is heavily referenced in other interoperability frameworks, making it a natural choice. Germany's SAGA is second of most mature interoperability frameworks. Greece brings to the sample ambitious and most recent effort of so called second generation interoperability framework.

The following subsections present key observations about the sample interoperability frameworks that we analysed. The intent here is not to give exhaustive analyses, but rather to highlight and contrast the most salient features and aspects of these interoperability frameworks.

European Interoperability Framework

The EU's EIF and the supporting IDABC Architecture Guidelines (2004) are intended to address the interoperability of pan-European eGovernment services (PEGS). Its scope includes A2A, A2C, and A2B (where "A" stands for "Administration", "C" for "Citizens" and "B" for "Business").

The EIF identifies three types of PEGS interactions:

- Direct interaction between citizens or enterprises of one Member State with administrations of other Member States and/or institutions.
- The exchange of data between administrations of different Member States in order to resolve cases that citizens or enterprises may raise with the administration of their own country.
- The exchange of data between various EU institutions or agencies, or between an EU institution or agency and one or more administrations of Member States.

The EIF's recommendations are quite high level, whereas the related IDABC Architecture Guidelines (2004) are very low level (mentioning many specific standards such as PKI (Public Key Infrastructure), XML

(Extensible Mark-up Language), SOAP, WSDL (Web Services Description Language), etc.), thereby leaving a large gap between these two sets of specifications.

The impact of the EIF so far appears to have been rather modest, in part, because PEGS have not yet appeared in significant numbers. Nevertheless, the EIF is referenced frequently in national interoperability frameworks, most of which at least claim the intention of complying with it (Charalabidis et al., 2007; Malotau, van der Harst, Achtsivassilis and Hahndiek, 2007; Rothenberg et al., 2008).

eGovernment Interoperability Framework of United Kingdom

The eGIF is intended to help create interoperable systems working in a seamless and coherent way across the public sector in order to provide better services, tailored to the needs of citizen and business at a lower cost. Its scope includes G2G, G2C, G2B (UK to worldwide) (where "G" stands for "Government", "C" for "Citizens" and "B" for "Business"), UK to EU/USA, etc.

It is one of the most mature national interoperability frameworks: its first version was published in 2001, and it had reached version 6.1 as of March 2005. It specifies the use of SOA as well as providing support, best practice guidance, toolkits, and centrally-agreed schemas (for example, involving XML). (Adam Smith Research Trust, 2006; Maslen, 2005; Rothenberg et al., 2008)

This framework appears today in a crossroad since it has to grow in scope in order to accommodate the different kinds of technical and process standards and adopt a newer, more business needs oriented governance regime. To date, the UK eGIF has focused on standards for interconnection, data integration, content management metadata, eServices access and channels, and standards for specific business areas, yet the interoperability problem remains. What is new now in the UK is the realisation that an open standards "landscape" is but a foundation for a larger, more holistic requirement, "the government enterprise architecture" and that more attention needs to be paid on the "process" and the "people" dimensions, ensuring that everything from governance to technical standards selection and mandation is business needs driven and not technology opportunity driven (Charalabidis et al., 2007).

The lessons from the UK experience for others

embarking on creating an e-GIF are (Charalabidis et al., 2007):

- In order to make the leap straight into the enterprise architecture approach, each country's eGovernment community must have the vision, leadership, managerial and technical capability to meet the real business need through different technologies and to work at a high level of sophistication.
- Policy makers, strategists and implementation planners must be prepared for achieving evolutionary, not revolutionary changes – a small step at a time – and keep in mind that the long haul – quick wins will seem to be small wins in the grand scheme of things. They must not pin their faith for adoption of the eGIF on penalties for non-cooperating, but should impose their will with the help of incentives to the involved organizations.
- The starting position must be well understood and benchmarked so that the gap between the 'as is' and the 'to be' states are well defined. Ongoing monitoring of change needs to be in place in order to know quantitatively what difference the effort has made. Time frames for measurable change need actually to stretch out into years.
- Winning “hearts and minds” is crucial and mechanisms for increasing awareness must be foreseen. Education schemes to help people “get with the programme” and become recognised “eGovernment professionals” are also required.
- The supplier community must be in partnership with the government community, with a shared understanding of the means of delivery and the ends sought.

Standards and Architectures for e-Government Applications (SAGA)

In Standards and Architectures for E-Government Applications (SAGA), the German eGovernment Interoperability Framework, moving from task-oriented to process-oriented Administration appears today as the key challenge to overcome. Regarding the current version of the SAGA, the Reference Model of Open Distributed Processing (RM-ODP) is not well used since standards are not appropriately associated to viewpoints and there are many aspects not yet established, e.g. the creation of an XML Data Repository which is currently under way, or not equally addressed, such as the enterprise viewpoint in comparison to the technology viewpoint. Finally, SAGA partially has too much “German / Bund Flavor” and there is not sufficient internationalization at EU level (Charalabidis et al., 2007).

Further lessons learnt from the experience with SAGA suggest that:

- Standards and technologies to be followed should be proposed in an eGIF, yet a determination on certain technologies is not necessary for achieving interoperability and should not be integrated in eGIFs since variety guarantees continuous

innovation and competition and prevents market foreclosure;.

- A bottom-up approach needs to be adopted covering equally all the viewpoints of the RM-ODP: technology, information, enterprise, computational and engineering. Creating patterns of standard processes and data models for similar services must be pursued.
- The continuous revises of the eGIF must be balanced between adding the latest developments and experiences (through the discussion in the public eGIF forum) and its being characterized as too complex and overregulated.

Greek e-Government Service Provision and Interoperability Framework

The new Greek e-Government Service Provision and Interoperability Framework introduces a new system (not a paper-based specification) that will interact with eGovernment portals and back-office applications, guiding their evolution and ensuring interoperability by design, rework or change. The implementation addresses a number of key issues, such as (Chalabidis et al., 2007):

- Development of unified governmental data models (in the direction of Core Components).
- Specification of truly interoperable, one-stop governmental services.
- Definition of standards and rules, against which Governmental sites will be constantly measured and certified.
- Adoption of protection, security and authentication mechanisms and arrangement of the corresponding legal issues.
- Change management procedures and customization techniques for applying the findings to the specific public administration needs and demands.

The initial application of the Greek eGIF, as well as the evolutions of the German and UK eGIF's are indicating that new perspectives should be taken into consideration from now on, analysed as following (Vitkauskaitė, Gatautis, 2008):

- Importance and adequate effort should be put in defining standard electronic services for businesses and citizens, thus providing clear examples to administrations and service portal developers.
- The paper-based specification should give way to system-based presentation of the framework, incorporating service descriptions, data definitions, certification schemes and application metrics in a common repository.
- Organisational interoperability issues should be supported by a more concrete methodology of how to transform traditional services to electronic flows.
- The collaboration among European eGovernment Interoperability Frameworks is particularly beneficial for the ongoing frameworks, since it ensures that lessons from the pioneers' experience are learnt and that the same mistakes will not be repeated.

Future work along the Greek eGIF includes research

on the distinct frameworks complementing its first release, publication of XML Schemas based on Core Components methodology, initial training of key staff within administrations and extension of the system in order to encourage stakeholders to engage themselves and build synergies across the public sector in a truly interdisciplinary way (Charalabidis, Lampathaki, Sarantis et al., 2008).

Comparison of different interoperability frameworks

The results of different eGIFs are presented below

comparing them by interoperability dimensions addressed, layers identified, scope and interest groups. Interoperability is frequently viewed as having number of distinct *dimensions*. One of the earliest views of interoperability is the *layered* or “stack” view of interaction among computer systems over a network. The earliest popular version of this view was the traditional Open Systems Interconnect (OSI) model, here are listed layers identified by eGIFs analysed. Scope and interested groups views are concerned with the functional range of an interoperability framework. Within the broad domain of eGovernment, interoperability may be tasked with a range of different scopes.

Table 1

Comparison of different interoperability frameworks

Criteria	EIF (IDABC, 2008)	UK eGIF (Cabinet Office, 2005)	SAGA (KBSt, 2006)	Greek eGIF (The Greek eGIF, 2008)
Dimensions	Organizational interoperability Semantic interoperability Technical interoperability Political context Legal interoperability	Only technical interoperability covered	Organizational interoperability Semantic interoperability Technical interoperability	Organizational interoperability Semantic interoperability Technical interoperability
Layers	Basic Public Functions Secure Data Exchange Aggregate Services Administration, Business, Citizens	Interconnectivity Data integration Content management metadata eServices access	Enterprise viewpoint Computational viewpoint Technical viewpoint Engineering viewpoint Information viewpoint	Systems Standards and specifications Coordination
Scope	Direct interaction between citizens or enterprises of one Member State with administrations of other Member States and/or institutions. The exchange of data between administrations of different Member States in order to resolve cases that citizens or enterprises may raise with the administration of their own country. The exchange of data between various EU institutions or agencies, or between an EU institution or agency and one or more administrations of Member States.	The e-GIF covers the exchange of information between government systems and the interactions between: UK Government and citizens UK Government and intermediaries UK Government and businesses (worldwide) UK Government organisations UK Government and other governments (UK/EC, UK/US, etc.).	There are three target groups for the Federal administration's services: Citizens (Government to Citizens – G2C) Companies (Government to Business – G2B) Administration (Government to Government – G2G) SAGA's scope of validity covers the federal administration and software systems with interfaces between federal authorities and federal-state and/or municipal authorities in order to support the public services.	<i>Organisational aspect:</i> 20 ministries, 13 prefectures, 52 districts, 1000 municipalities and 1000 governmental “points of service” delivering over 3000 public services. <i>Systems aspect:</i> 200 governmental internet portals, 1000 municipal internet portals, 2500 public administration back office systems. <i>Non-governmental stakeholders aspect:</i> 750 000 companies, 11 000 000 citizens, 18 000 000 tourists per year and over 20 000 000 service requests per year.
Interest groups	Administration policy makers responsible for eGovernment service development and operation, Administration officials responsible for ICT systems implementation (and by extension any contractors working on their behalf)	UK government which includes central government departments and their agencies, local government, and the wider public sector, e.g. non-departmental public bodies (NDPBs) and the National Health Service (NHS).	SAGA is primarily designed for decision-makers in the fields of organization, information technology and eGovernment teams in German administrations.	All governmental institutions in Greece.

Lithuanian eGovernment Interoperability Framework

Basing on the analysis of best practice interoperability framework the following recommendations might be provided towards formulating Lithuanian eGovernment Interoperability Framework:

- The framework should address organizational interoperability, semantic interoperability and technical interoperability issues.
- The eGIF should provide high level standards (the data, technical, authentication, web portal and multi-channel access standards) for systems used in public eService provision.

- The interoperability framework should be addresses to national level institutions. The further development of eGIF should take into consideration regional and local issues.
- Representatives of governmental organizations will be the main stakeholders in development eGIF.

The proposed approach is presented in Figure 2.

Based on the analysis of best practices, future eGovernment interoperability framework should focus on the second generation of interoperability frameworks trends. The framework should consist of traditional interoperability dimensions – technical, organizational and semantic interoperability, but also include a political dimension of interoperability, enabling the uniform policy as a necessary precondition for interoperability problems.

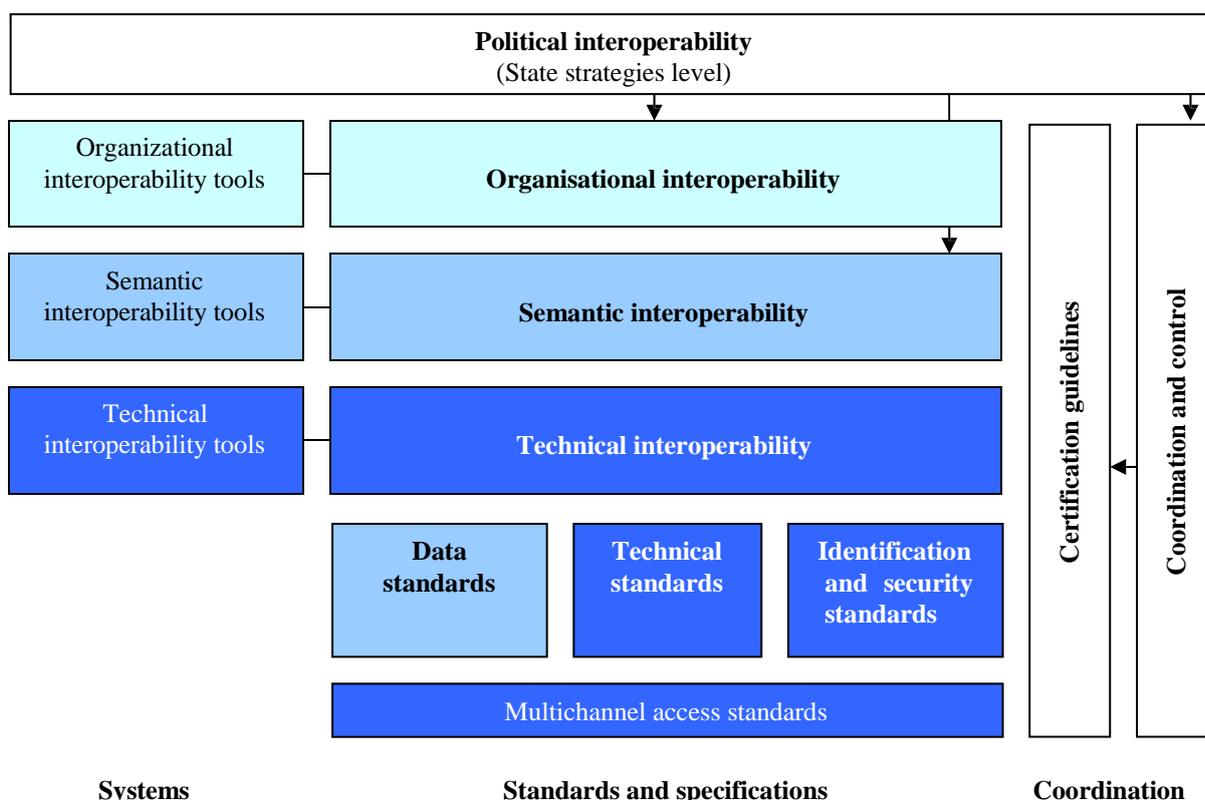


Figure 2. Proposed Lithuanian eGovernment interoperability model

Interoperability framework also contains systems that generate and/or process sets of allowing the authorities to use existing good practice, and not to re-create original solutions. The eGIF must contain coordination component, which is associated with the existing systems certification and accreditation and the granting of the necessary knowledge.

Interoperability problems in Lithuania

Taking into consideration the importance of eGovernment interoperability issues, the series of interviews were carried out with different stakeholders. The interviews allowed indentifying these key problems of Lithuania eGovernment interoperability within eGIF context:

At the political level:

- There are no support for the use of standards or other legal and good practice documents (e.g. prepared by the IDABC program).
- There no support to promote good practice of interoperability solutions.
- The high decentralization of state registries exists. Strong Register Centralization policy (e.g. transfer of the entire registry to the Registers Center) could be accelerate the interoperability issues.

At the legal level:

- There is no generally accepted document format for data among organizations (in particular, between government organizations). Every

institution uses different formats each time.

- Legal requirements from different authorities, in the absence of commonly adopted formats, often intersect.
- The service level agreement is not adopted.
- There is no standard safety specifications, which could be implemented and the system of security-assessment validation.

At the semantic level:

- Each institution uses its own semantic data exchange requirements, and standardized specification does not exist (such as the XML data should look scheme and the like).
- Frequently authorities do not have the data for the “semantic menu” (e.g. the possible data sets, the XML data schemes), and every time propose a new combination.
- eDocuments data structure is not defined.

At the technical level:

- There is no common agreement of technical realization.
- There is no standardization of the general requirements for data exchange protocols.
- There is no standardization of the general requirements for security requirements of data exchange.

Conclusions

The following conclusions might be presented:

- The interoperability issues have been seriously affecting eGovernment development at European, national and local levels. Facing interoperability challenges policy makers must take adequate decisions for solving these issues.
- Interoperability might be defined narrowly or broadly. From the point of view of authors interoperability is ability to exchange information, knowledge and experience between institutions.
- Importance and adequate effort should be put in defining standard electronic services for businesses and citizens, thus providing clear examples to governmental institutions.
- The proposed eGovernment interoperability framework outlines the technical, semantic and organisational dimensions and stresses the importance of political interoperability. It also provides three layers model moving from only standards and specifications based approach to systems and coordination support elements.
- The lack of political leadership is the main constrain within eGovernment interoperability issues. The state should appoint the institution which will take leadership in development and implementing eGovernment interoperability framework.
- The eGovernment interoperability framework should address political, organization, semantic and technical dimensions. The framework should be based on 2nd generation approach –

to provide not only the specifications and standards, but also built tools for implementing eGIF and ensure coordination mechanism for implementing it.

- The eGIF should provide high level standards (the data, technical, authentication, web portal and multi-channel access standards) for systems used in public eService provision.
- The lack of dialogue between state institutions causes serious interoperability problems. The initiation of constructive dialog (e.g. task force for interoperability) and supporting share of current successful solutions will allow facilitation of interoperability issues tackling within the country.

Acknowledgement

The current research was funded by Ministry of Interior of the Republic of Lithuania and Lithuanian State Science and Studies Foundation.

References

1. Adam Smith Research Trust. *Rewiring Democracy: Better e-government for the UK*. London, 2006. Available at: http://www.adamsmith.org/images/uploads/publications/egov3_final.pdf.
2. Cabinet Office – e-Government Unit *e-Government Interoperability Framework*, Version 6.1, 2005.
3. Charalabidis, Y. (2007). Advancing the eGovernment Interoperability Framework in European Countries: Architectures, Challenges and Perspectives from the New Greek eGIF / Y. Charalabidis, M. Tschichholz, A. Hopkirk. Proceedings of the eChallenges 2007 Conference. BIOS Press, The Hague, 134–141.
4. Charalabidis, Y. (2008). *The Greek Electronic Government Interoperability Framework: Standards and Infrastructures for One-Stop Service Provision* / Y. Charalabidis, F. Lampathaki, D. Sarantis, A.-M. Sourouni, S. Mouzakitis, G. Gionis, S. Koussouris, C. Ntanos, C. Tsiakaliaris, V. Tountopoulos, D. Askounis, PCI 2008: 12th Pan-Hellenic Conference On Informatics, Proceedings, 66–70.
5. Damaskopoulos, T., Gatautis, R., & Vitkauskaitė, E. (2008). Extended and dynamic clustering of SMEs. *Inzinerine Ekonomika-Engineering Economics*(1), 11-21.
6. Dzemydiene, D., Maskeliunas, S., & Dzemyda, I. (2008). Interoperability of information system components for monitoring of sewage and intelligent analysis of water resources. *Technological and Economic Development of Economy*, 14(3), 260-278.
7. Egyedi, T. M. (2007). *Standard-compliant, but incompatible?* // Computer Standards & Interfaces, No. 6 (29), 605–613.
8. Gatautis, R. (2008). The Impact of ICT on Public and Private Sectors in Lithuania. *Inzinerine Ekonomika-Engineering Economics*(4), 18-28.

9. Gatautis, R. (2006). *E-business development in Lithuania: problems and perspectives* / R. Gatautis, R. Gudauskas // The 5th Wuhan International Conference on E-Business: Integration and Innovation through Measurement and Management, Wuhan, China, May 27–28, 2006. Vol. 1. Alfred, 176–183.
10. Guijarro L. (2007). *Interoperability frameworks and enterprise architectures in e-government initiatives in Europe and the United States* // Government Information Quarterly, No. 1 (24), 89–101.
11. Guijarro, L. (2009). *Semantic interoperability in eGovernment initiatives* // Computer Standards & Interfaces, No. 1 (31), 174–180.
12. IDABC *Architecture Guidelines: For Trans-European Telematics Networks for Administrations*, Version. 7.1. Brussels, 2004. Available at: <http://ec.europa.eu/idabc/servlets/Doc?id=19280>.
13. IDABC *Architecture Guidelines: For Trans-European Telematics Networks for Administrations Annexes*, Version. 7.1. Brussels, 2004. Available at: <http://ec.europa.eu/idabc/servlets/Doc?id=19281>
14. IDABC *Draft document as basis for EIF 2.0*. Brussels, 2008. Available at: <http://www.harianregional.com/>
15. IDABC *European Interoperability Framework for pan-European e-Government Services*, Version 1.0. Brussels, 2004. <http://europa.eu.int/idabc/en/document/3761>.
16. Institute of Electrical and Electronics Engineers. *IEEE Standard Computer Dictionary: A Compilation of IEEE Standard Computer Glossaries*. New York, 1990.
17. Janssen, M. (2007). *Interoperability for electronic governance* / M. Janssen, H. J. J. Scholl. *Proceedings of the 1st international conference on Theory and practice of electronic governance*. 45–48.
18. Kasubiene, L. & Vanagas, P. (2007). Assumptions of E-government Services Quality Evaluation. *Inzinerine Ekonomika-Engineering Economics*(5), 68-74.
19. Kazemikaitiene, E., & Bileviciene, T. (2008). Problems of involvement of disabled persons in e. government. *Technological and Economic Development of Economy*, 14(2), 184-196.
20. KBSt unit at the Federal Ministry of the Interior. (2006). *SAGA: Standards and Architectures for e-Government Applications* Version 3.0.
21. Malotiaux, M. (2007). *Preparation for Update European Interoperability Framework 2.0: Final report* / M. Malotiaux, G. van der Harst, J. Achtsivassilis, F. Hahndiek, F. Gartner, Inc. Available at: <http://ec.europa.eu/idabc/servlets/Doc?id=31505>.
22. Maslen, J. (2005). *What's eGIF got to do with it?* GEO: connexion. Available at: http://www.accessmylearning.com/coms2/summary_0286-3889812_ITM.
23. Müller, M. (2006). *eGovernment, Interoperability and Innovation / Proceedings of the eChallenges 2006 Conference*, BIOS Press, The Hague, 68–74.
24. Rothenberg, J. (2008). *Towards a Dutch Interoperability Framework: Recommendations to the Forum Standaardisatie* / J. Rothenberg, M. Botterman, C. van Oranje-Nassau. RAND Corporation.
25. Scholl, H. J. J. (2005). *Interoperability in e-Government: More than Just Smart Middleware*. Proceedings of the 38th Annual Hawaii International Conference on System Sciences (HICSS38).
26. Skietrys, E., Raipa, A., & Bartkus, E. V. (2008). Dimensions of the efficiency of public-private partnership. *Inzinerine Ekonomika-Engineering Economics*(3), 45-50.
27. Tambouris, E. (2007). *Study on Interoperability at Local and Regional Level* / E. Tambouris, K. Tarabanis, V. Peristeras, N. Liotas, Technical report, Modinis Lot 2.
28. *The Greek eGIF Website*. <http://egif.epu.ntua.gr>
29. Vitkauskaitė, E. (2008). *eGovernment interoperability issues in Lithuania* / E. Vitkauskaitė, R. Gatautis, ICEB-2008: proceeding of the Eight International Conference on Electronic Business “Enriching Global Business practices”. Hong Kong. 80–87.
30. Zhao, J. L. (2007). *Web services and process management: a union of convenience or a new area of research?* / J. L. Zhao, H. K. Cheng. *Decision Support Systems*, No. 40, 1–8.

Rimantas Gatautis, Genadijus Kulvietis, Elena Vitkauskaitė

Lietuvos e. valdžios suderinamumo strateginis modelis

Santrauka

Pastaraisiais metais buvo labai daug diskutuojama apie žinių ekonomiką ir informacinę visuomenę. Šiuo metu jau konkrečiai kalbama apie elektroninę vyriausybę, elektroninį verslą ir elektronines paslaugas. Europos Taryba patvirtino veiksmų planą, kuriuo numatė, kad Europos Sąjungos valstybėse bus išplėtos modernios elektroninės paslaugos: elektroninė vyriausybė, nuotolinis mokymas, sveikatos apsaugos ir priežiūros paslaugos, bus sudarytos sąlygos ir aplinka elektroniniam verslui. Pagrindinis viešųjų elektroninių paslaugų teikimo tikslas – siekti pagerinti trijų pagrindinių šalių (gyventojų, verslo įmonių, viešojo administravimo institucijų) poreikių tenkinimą bei supaprastinti jų tarpusavio bendravimą ir komunikaciją. Tačiau elektroninių paslaugų plėtra atsiremia į institucijų sąveikumą (angl. *interoperability*). Sąveikumas šiuo atveju – tai organizacijų veiklos ir sistemų derinimas, siekiant suformuoti efektyvesnę informacijos perdavimą tarp atskirų valdžios institucijų ir viešojo sektoriaus. Nesuformavus realios galimybės dalytis informacija elektroninė valdžia (toliau – e. valdžia) praranda svarbią dalį savo funkcijų ir negali užtikrinti informacijos objektyvumo ir patogaus prieinamumo. Daugelyje Europos Sąjungos šalių sprendžiant šią problemą yra kuriamos e. valdžios sąveikumo gairės (angl. *e-Government Interoperability Framework*; toliau – eGIF). eGIF sukuria prielaidas plėtoti glaudesnius ryšius tarp institucijų, vyriausybės ir piliečių, vyriausybės ir verslo sektoriaus.

Šiame straipsnyje nagrinėjamas objektas yra elektroninės valdžios sąveikumas.

Straipsnio tikslas yra išanalizuoti sąveikumo koncepcijas ir galimus sąveikumo strateginių gairių įgyvendinimo barjerus, palyginti Europos Sąjungos ir jos šalių narių gerosios patirties pavyzdžius įgyvendinant elektroninės valdžios suderinamumo strategines gaires bei pateikti Lietuvos elektroninės valdžios strateginių gairių modelį.

Tyrime taikyti sisteminės, loginės ir palyginamosios analizės metodai.

Svarbiausi rezultatai. Sąveikumas gali būti apibrėžiamas siaurai ir plačiai. Remiantis siauruoju apibrėžimu, suderinamumas yra informacinių ryšių technologijų sistemų gebėjimas bendrauti

tarpusavyje, išnaudojant viena kitos galimybes, arba suteikti sudėtingas galimybes jų vartotojams žmonėms. Svarbu pažymėti, jog netgi siaurajame apibrėžime pabrėžiamas suderinamumas skirtinguose lygmenyse, nuo žemiausio (tinklo komunikacijų protokolų) iki aukščiausio (semantinės kiekvienos sistemos terminologijos, skaičiavimų ir rezultatų interpretacijos).

Platusis sąveikumo apibrėžimas apima ne tik informacinių ryšio technologijų (toliau – IRT) sistemas. Remiantis šiuo požiūriu, sąveikumas tarp IRT sistemų yra priemonė siekiant tikslo: suteikiant įstaigoms, organizacijoms, vartotojų (piliečių ar verslo) grupėms, savivaldybėms, regionams ar netgi tautinėms valstybėms galimybes sąveikauti tarpusavyje efektyviau ir veiksmingiau. Bendras sąveikumo tikslas yra pagerinti šiuos organizacinius ir visuomeninius ryšius.

Plačiajame apibrėžime skirtingos šalys arba Europos Sąjunga (toliau – ES) konkrečius sąveikumo tikslus ir strategijas apibrėžia skirtingai. Pavyzdžiui, jos gali akcentuoti valdžios paslaugų teikimo sąnaudų sumažinimą, tokių paslaugų išplėtimą ir integravimą, komercijos palengvinimą, rutininių ryšių tarp piliečių ir valdžios supaprastinimą, valdžios informacijos piliečiams prieinamumo palengvinimą, valdžios skaidrumo padidinimą, nacionalinių paslaugų susiejimą su susijusiomis paslaugomis ES šalyse narėse ir t. t. Tokie aiškūs tikslai ir strategijos turėtų sukurti sąveikumo gaires – aukšto lygio strategijų, principų ir techninių rekomendacijų rinkinį.

Europos Sąjungoje elektroninės valdžios klausimai politiniu lygiu keliami jau nuo 1993 m. kai buvo pateiktas Delors straipsnis. Pastaraisiais metais didelis dėmesys skiriamas ir sąveikumo aspektui e. valdžios kontekste bei daugelyje Europos Sąjungos šalių kuriamos e. valdžios sąveikumo gairės.

ES šalių patirties palyginimas leidžia įvertinti sąveikumo gaires pagal tam tikras kategorijas: dimensijas, lygius, sritį ir interesų grupes. Dažnai manoma, kad sąveikumas turi kelias skirtingas dimensijas. Vienas iš ankstyviausių požiūrių į sąveikumą buvo susluoksniuoto į lygius sąveikos tarp kompiuterių tinkle požiūris. Pirmoji populiari tokio požiūrio versija buvo Open Systems Interconnect (OSI) modelis, o lygiai įvardyti analizuojamose nacionalinėse e. valdžios sąveikumo gairėse. Sritis ir interesų grupės atskleidžia gairių funkcinę apimtį, t. y. kokiems santykiams (tarp konkrečių grupių) ir kokioms konkrečioms grupėms skirtos gairės.

Apibendrinant ES patirtį, galima išskirti šiuos pasiūlymus kuriant Lietuvos e. valdžios sąveikumo gaires:

- Gairėse turi būti apimamos organizacinio, semantinio ir techninio sąveikumo dimensijos, kurioms suteikiama vienoda svarba;
- Gairėse turi būti pateikiami sistemų, naudojamų teikiant viešąsias e. paslaugas, aukšto lygio standartai (duomenų, techniniai, atpažinimo, tinklalapių ir daugiakanalės prieigos);
- Gairės turi būti taikomos nacionalinio lygio valdžios institucijoms, o tolesnė e. valdžios sąveikumo gairių plėtra turėtų atsižvelgti ir į regiono, ir į vietinės valdžios institucijas;
- Valdžios institucijų atstovai bus pagrindinė interesų grupė įgyvendinant e. valdžios sąveikumo gaires.

Pasiūlytą preliminarų Lietuvos e. valdžios sąveikumo gairių architektūros modelį sudaro trys lygiai:

- „Sistemų“ lygmuo, susidedantis iš priemonių, užtikrinančių organizacinį, semantinį ir techninį sąveikumą;
- „Standartų ir specifikacijų“ lygmuo, kuriame formuluojamos specifikacijos, skirtos spręsti organizacinio, semantinio ir techninio sąveikumo klausimus. Jame taip pat nustatomi duomenų, atpažinimo, tinklalapių ir daugiakanalės prieigos standartai;
- „Koordinavimo“ lygmuo, kuriame numatomos sertifikavimo gairės, skirtos vertinti atitiktumą gairėms, bei koordinavimas ir kontrolė, skirti apibrėžti, kokios institucijos ir kokiais būdais turėtų užtikrinti sėkmingą Lietuvos e. valdžios gairių įgyvendinimą šalyje.

Lietuvos e. valdžios sąveikumo gairių architektūros modelis siejasi su šiuo metu priimtomis Europos sąveikumo gairėmis, taip pat su rengiama jų antrąja versija, kadangi jame didelis dėmesys kreipiamas vienodai visoms sąveikumo dimensijoms: organizaciniam, semantiniam ir techniniam sąveikumui. Antrojoje versijoje papildomai išskirtos politinio konteksto ir teisinio sąveikumo dimensijos. Politinis kontekstas modelyje yra įvertintas, o teisinis sąveikumas neatsispindi modelyje, tačiau į šią dimensiją, be abejojimo, bus kreipiamas dėmesys detalizuojant ir įgyvendinant Lietuvos e. valdžios sąveikumo gaires ateityje.

Raktažodžiai: *e. valdžia, sąveikumas, sąveikumo modelis, sėkmės veiksniai*

The article has been reviewed.

Received in January, 2009; accepted in April, 2009.

DOI: 10.5755/j01.ee.62.2.11614