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Learning from the Netherlands and Estonia

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Making e-Government Work:

Learning from the Netherlands and Estonia

Nitesh Bharosa, Silvia Lips and Dirk Draheim

Abstract: Countries are struggling to develop data exchange infrastructures needed to reap the benets of e-government. Understanding the development of infrastructures can only be achieved by combining insights from institutional, technical and process perspectives. This paper contributes by analysing data exchange infrastructures in the Netherlands and Estonia from an integral perspective. The institutional design framework of Koppenjan and Groenewegen is used to analyse the developments in both countries. The analysis shows that the starting points, cultures, path dependencies and institutional structure result in dierent governance models for data exchange infrastructures. Estonia has a single - centrally governed - data-exchange infrastructure that is used by public and private parties for all kinds of data exchanges (including citizen-to-business and business-to-business). In contrast, the institutional structure in the Netherlands demands a strict demarcation between public and private infrastructures, resulting in several data exchange infrastructures. While there are examples of sharing infrastructure components across various levels of the Dutch government, public infrastructures cannot be used for business-to-business or citizen-to-business data exchange due to the potential for market distortion by government. Both the centrally governed Estonian model and the decentrally governed Dutch model have pros and cons on multiple levels.

Keywords:
E-government,
data-exchange
infrastructures,
institutional design

1. Introduction

Across the globe, demands on public services are increasing at a fast pace, partly due to the wide-spread availability of new technologies and higher expectations from digitally-savvy citizens. Citizens expect personalized customer journeys at all levels of government, as they have become accustomed to smartphone-empowered lives[1]. New digital data exchange infrastructure are essential for broader service access as well as the provision of signicant benets to service users at a reduced cost. However, even large budgets are no guarantee for successful digital government transformations[2, 3]. From a purely technological perspective, all of this is hard to explain.

This paper argues that, in order to understand what contributes to the success of e-government, we also need to consider the institutional design as well as the design process of developing data-exchange infrastructure. Aiming to learn from successful examples, this paper conducts a comparative case study on two leading countries in e-government: the Netherlands and Estonia. Both the Netherlands and Estonia are in the group of high performers in the e-Government Development Index[4], and both countries have widely adopted data exchange infrastructures[5, 6], enabling for instance a pre-filled tax return form that takes minutes to electronically check and submit. For the sake of this paper, a data exchange infrastructure is dened as *the whole of standards, technical components, services and governance framework in place for data exchange*. These are by nature socio-technical constructs[7, 8], which makes them hard to understand from a single point of view. Data exchange infrastructures are essential when it comes to the successful delivery of e-government services, since they facilitate process,

application and data integration across the various government silos. Therefore, the maturity of data exchange infrastructure can be used as a proxy for e-government maturity.

While there is a growing body of knowledge on the technical design and the governance of data exchange infrastructures, we lack insights from a combined institutional, technical and process perspective. The goal of this paper is to analyse the development of data exchange infrastructures from such a combined design perspective. We conduct the comparative case study by adopting the theoretical framework for multi-facet design of socio-technical systems by Koppenjan and Groenewegen[9]. Koppenjan and Groenwegen state: "Institutions concern different levels of analysis like laws and regulations as well as contracts and organisations which regulate and coordinate the behaviour of actors in complex networks"[9]. Therefore, the framework is suitable for analysing complex socio-technical situations for policy making.

This paper proceeds as follows. Section 2 describes the research approach, which centres around a four day workshop in Estonia. Section 3 discusses the theoretical analysis framework of Koppenjan and Groenewegen that we use to compare data exchange infrastructure policies in the Netherlands and Estonia. Section 4 provides a high-level description of the selected cases the Netherlands and Estonia with respect to their e-government background. The findings of this paper are discussed in Sect. 5. Section

2. Research Approach

To analyse the development of data exchange infra-structures, we conduct a comparative case-study on the design of the data exchange infrastructures in the Netherlands and Estonia. The research draws on an international collaboratione facilitated by Digicampus[3], a quadruple-helix-based innovation partnership for public service innovation in the Netherlands. One of the missions of Digicampus is to facilitate international collaboration on designing the next generation of public services. One of the vehicles for realizing this is an international collaboration agenda, focusing on current issues in e-government, learning from each other's e-government agendas and pinpointing topics that are suited for collaborative research and proto-typing. The rst concrete research activity as part of this agenda was a four-day workshop in Tallinn from November 18 to 21, 2019. Table 1 provides an overview of this workshop.

ASPECT	DETAILS
Date	18-21 November 2019
Location	Tallinn University of Technology
Participants	The Netherlands: 14 participants (8 policy makers, 3 researchers, 3 software providers) Estonia: 11 participants (4 policy makers, 5 researchers, 2 software providers)
Agenda (high level)	Day 1: Presentations on the current e-government designs and future challenges in both countries. Day 2: Working sessions on the challenges surrounding digital identities and e-government. Day 3: Working sessions on the countries' data exchange infra-structures. Role playing game on self-sovereign identities in the future. Day 4: Reflection, updating the common collaboration agenda, prioritizing collaborative research questions.
Data collection methods	Workshop notes, role playing game, Mentimeter, collective agenda writing.

Table 1. Overview of the workshop in Tallinn, Estonia.

3. The Theoretical Analysis Framework

Koppenjan and Groenwegen[9] introduce an analysis framework for a certain class of large-scale techno-logical systems that do not consist merely out of technological assets, but involve institutions as part of their solutions. Institutions regulate behaviour and are essential components of socio-technical systems. Sociotechnical systems are characterized by their complexity due to the many dependencies between the institutional and technology parts shaped by change processes. Koppenjan and Groenwegen suggested to analyze such system as a technological design that is teamed together with an institutional design[10], see Fig. 1 ("co-design perspective").

Moreover, they suggest to make the design of the design process (*process design*) explicit in the analysis of such system (the *design process* in Fig. 1 is simply the process that yields the technological design and the institutional design, the *process design* is actually a '*design process*' design). For our purposes, it is important to understand all designs (technological design, institutional design and process design) as continuously recurring endeavours that evolve and improve over time. Now, technological design is about "demarcation, components, relations, processes"[9] of/in the technological system; institutional design is about "arrangements between actors that regulate their relations: tasks, responsibilities, allocation of costs, benets and risks"[9]; process design is about "who participates in the design process; what are the conditions, rules, roles, items, steps, etc."[9].

In order to adequately grasp institutional design, Koppenjan and Groenewegen introduce a second perspective that adapts Williamson's four-layer model of economics of institutions[11], see again Fig. 1 ("institutional analysis perspective"). Layer 4 is the layer of the "*informal* institutional environment of socio-technical systems", which is about "norms, values, orientation, codes (informal institutions, culture)"[9], see also[12], compare with[13]. Layer 3 is the layer of the "*formal* institutional environment"[9], which is about "formal rules, laws and regulations, constitutions (formal institutions)"[9], see also[14], compare with[15]. Layer 2 is the layer of the "*formal and informal* institutional arrangements"[9], which is about "gentleman agreements, covenants, contracts, alliances, joint-ventures, merges, etc."[9] and informal "rules, codes, norms, orientation, relations"[9], see also[16], compare with[17]. Layer 1 is the layer of the "actors and games"[9], which is about "actors/agents and their interactions aimed at creating and influencing (infrastructural) provisions, services, outcomes"[9], compare with[18]. The systems that Koppenjan and Groenewegen address are large-scale systems: "energy networks, water management services [...], waste treatment, transport systems (rail, road, water, tube), industrial networks, information systems and telecommunication networks, city service"[9]. Information systems are among those systems, however, the model becomes actually relevant only if an information system is beyond the scope of usual enterprise architecture[19], i.e., involves an ultra-large-scale software system[20]. Therefore, e-government systems are typical instances of the system class characterized by the model of Koppenjan and Groenewegen[9], the model is a suitable candidate as an analysis framework for e-government systems, e-government ecosystems and interoperability solutions alike. This is why we have chosen the model as the theoretical basis of our comparative case study. In our analysis, we exploit both the perspective of relationships between technological/institutional/process design (that we call "co-design perspective" for short) and the four-layered model of institutional design (that we call "institutional analysis perspective" for short).

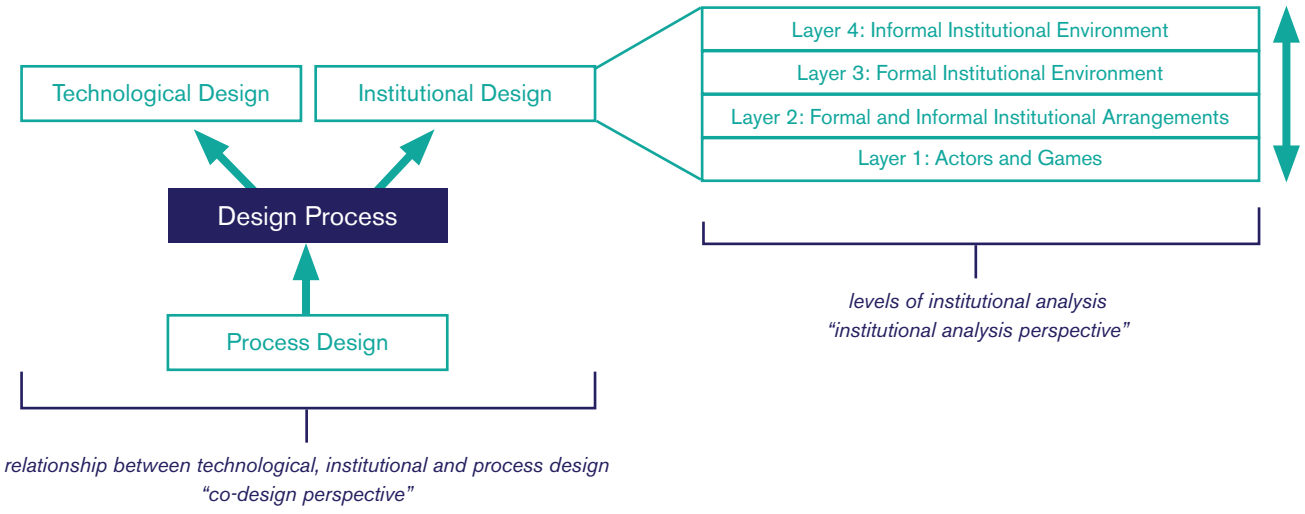

Fig. 1. A Institutional design model by Koppenjan and Groenewegen[9].

4. Background in the Netherlands and Estonia

4.1 The Netherlands

The Netherlands consistently performs well in e-government rankings[4]. The country has a high level of decentralized governance and public private collaboration in public service delivery. This decentralization results into various government agencies that use dierent infrastructures. For instance, the Tax administration uses a dierent data exchange infrastructure with the private sector and other government agencies (called Digipoort)[21] than the customs authority (called Single Window for Maritime and Aviation)[22]. Across different sectors such as health, energy and education, dierent data exchange infrastructures are used. Table 2 provides an (incomplete) overview of the main data exchange infrastructures in the Netherlands.

Table 2 is by no means exhaustive, but does highlight the variety in data exchange infrastructures. While some are only web-portal based, most infrastructures support application-to-application data exchange. Municipalities also have dierent infrastructures, which provides autonomy, but is not cheap to operate and maintain. On a municipal level, there is a growing tendency to combine forces and to develop and use a shared infrastructure. Inspired by the X-Road approach in Estonia, municipalities are currently piloting with the “common ground”.

4.2 Estonia

Estonia is signee of the D9 (Digital Nine) charter, i.e., a member of the “Digital Nations” network, also known as D9 or “Leading Digital Governments”. In media, on international conventions on digital transformation as well as in policy maker circles it is often perceived or presents itself as leader when it comes to e-government; actually, stakeholder from many countries, as from the Netherlands, have visited Estonia with the aim to learn from their success. The perception of Estonia as a digital leader might be, in large parts, due to communication strategy[23] and nation branding[24]; still: the technological, legal and organizational assets in Estonia have been designed with and for each other and evolved over time into a particularly stable e-government ecosystem. At the centre of the Estonian e-government ecosystem lies the interoperability framework X-Road[5, 25]. Estonia created X-Road - an application network for exchanging data among agency systems so that all government services are eectively available in one spot. In addition to oering querying mechanisms across multiple databases and supporting the secure exchange of documents[26], X-Road seamlessly integrates dierent government portals and applications. Also the private sector can also connect with X-Road to make queries and benet from access to a secure data exchange layer[27].

SECTOR	DATA EXCHANGE INFRASTRUCTURE
Citizen-to-government interaction	MijnOverheid (mijn.overheid.nl, also available as an app) is the national citizen portal with access to the online citizen message box + rerouting to multiple agency specific portals (e.g. social services, unemployment services, tax, municipal portal). With the exception of pension funds, businesses cannot use this portal (or the app) for data exchange with citizens.
Government to government data exchange (G2G)	Diginetwerk (logius.nl/diensten/diginetwerk) includes multiple networks, including municipal data exchange, base registers access and social services.
Financial reporting: B2G (business-to-government) and G2G	Digipoort (logius.nl/diensten/digipoort) is the government data exchange gateway including multiple services (i.e. authentication, authorisation, validation and archiving). Since Digipoort may not be used for B2B data exchange, there is private sector counterpart (Bancaire Infrastructurele Voorziening) with similar functionalities.
Trade & transport	Single Window for Maritime and Aviation (kvnr.nl/en/msw) for all communications intended for Customs and the Royal Netherlands Marechaussee / Seaport Police can be communicated electronically.
Public health services	Landelijk Schakelpunt (vzvz.nl/over-het-lsp) for data exchange in the medical domain.
Mortgages	Mortgages Data Network (HDN.nl) for data exchange in the mortgages domain.

Table 2. Overview of various data exchange infrastructures in the Netherlands.

5. Findings

The main objective of the workshop in Estonia was to learn from each other's approaches to e-government design and look ahead which challenges could be dealt with in a collaborative manner. Table 3 outlines the comparison based on the layered institutional analysis of the institutional design model of Koppenjan and Groenewegen[9].

During the workshops, multiple user/citizen oriented contexts were used to compare the e-governments in Estonia and the Netherlands: using the life event approach[30], user-centred scenarios were discussed in depth, specifically comparing the steps users need to take in order to achieve their goals. This provided rich case descriptions as substance for the institutional analysis frameworks. Next, Table 4 outlines the comparison based on the technological/institutional/process co-design perspective of the institutional design model of Koppenjan and Groenewegen[9].

The high-level technical design of the Dutch data exchange infrastructures is sketched in Fig. 2. In accordance with Table 2, citizens work with multiple data exchange infrastructures in the Netherlands. The demarcation is clear for public services and private services. When consuming public services, citizens can use the state-issued eID called DigID (digid.nl/en). The `MijnOverheid' portal and app provides data access to public agency messages (pdf les). This is a one-way data flow; for service consumption or data entry users need to go to the website/portal of the respective public agency. Here, they can use DigiD. Since law dictates that DigiD (as well as other public sector data exchange infrastructure components such as the `MijnOverheid' portal and app, the citizen message box and the Digipoort) can only be used by public organizations, private organizations have to use their own infrastructure or use sector-specic infrastructures (see Table 2 for an overview).

LAYER	THE NETHERLANDS	ESTONIA
Layer 4: Informal institutional environment	Government is trusted and consist of reliable institutions to meet performance expectations. Strong boundaries between public agencies and the private sector, yet long tradition in public-private collaboration.	Government is trusted[28, 29] and consist of reliable institutions to meet performance expectations. Open interaction between public agencies and the private sector.
Layer 3: Formal institutional environment	Legislation focused on public agency tasks (e.g. tax and customs laws) as well as laws on interactions with public agencies. No law on e-government in place yet (although a draft).	Exhaustive set of stable legal assets that are designed with respect to (resp. co-designed with) the technological assets of the e-government ecosystem.
Layer 2: Formal and informal institutional agreements	Decentralized steering of e-government. High level of autonomy across various levels of government. Moderate focus on economies of scale (e.g., the use of Digipoort by four government agencies, but not by banks for business-to-business data exchange), focus on administrative reduction by citizens and the public.	Centralized steering of e-government. Whole-of-government approach to modernize service delivery in a joined-up manner. Strong focus on economies of scale: the use of state eID, national registries and X-Road for both public and private services. Focus on creating transparency by showing all transactions.
Layer 1: Actors and games	Innovation is largely left to the market, strong emphasis on innovation by the private sector through outsourcing and grants (e.g., startups). Large enterprises are incentivized by the business potential when winning a multi-year service delivery tender. Innovation in the private sector is stimulated, but government is risk-averse and no knowledge and capacity building at the government.	Innovation by government for the entire society. Central government carries risks of innovation, strong emphasis on innovation and service delivery by government agencies. Experimentation by the govern ment is stimulated and in this way knowledge and understanding of the public and technology is created.

Table 3. Institutional analysis based on the Koppenjan and Groenewegen model [9].

	THE NETHERLANDS	ESTONIA
Technological design	Multiple digital infrastructures (mix of state-owned and -sourced as a service from the market). State-owned or -sourced infrastructures cannot be used for citizen-to-business or business-to-business data exchange.	Single, state-owned and -operated digital infrastructure (X-Road), which can be used for all kinds of e-services, including citizen-to-business and business-to-business data exchange. Strong focus on economies of scale: the use of state eID, national registries and X-Road for both public and private services.
Process design	Fragmented and loosely coordinated agency and sector-specic resource allocation and decision-making. Various national and local e-government and digital innovation agendas. Strong emphasis on the consultation of the private sector (i.e., software vendors) in the design and pre-procurement process. Coordination by having a standardization list and government architecture.	Tightly coordinated decision-making and resource allocation for e-government (CIO oce) based on a whole-of-government approach for achieving synergies. Focus on implementing shared design principles, including once-only and full transparency in data usage.
Institutional design	Highly autonomous government institutions. Separation of government agencies that create policy, deliver services and supervision agencies. Government agencies cannot compete with private enterprises in service delivery. There is a law that prohibits government agencies from developing digital technologies or services that are already available in the market.	Well-orchestrated government institutions. Regulated interplay of government agencies that create policy, deliver services and supervision agencies. Service provisioning is streamlined by a central authority. Government prototypes architectures for emerging challenges itself.

Table 4. Institutional comparison from the co-design perspective (Koppenjan and Groenewegen[9]).

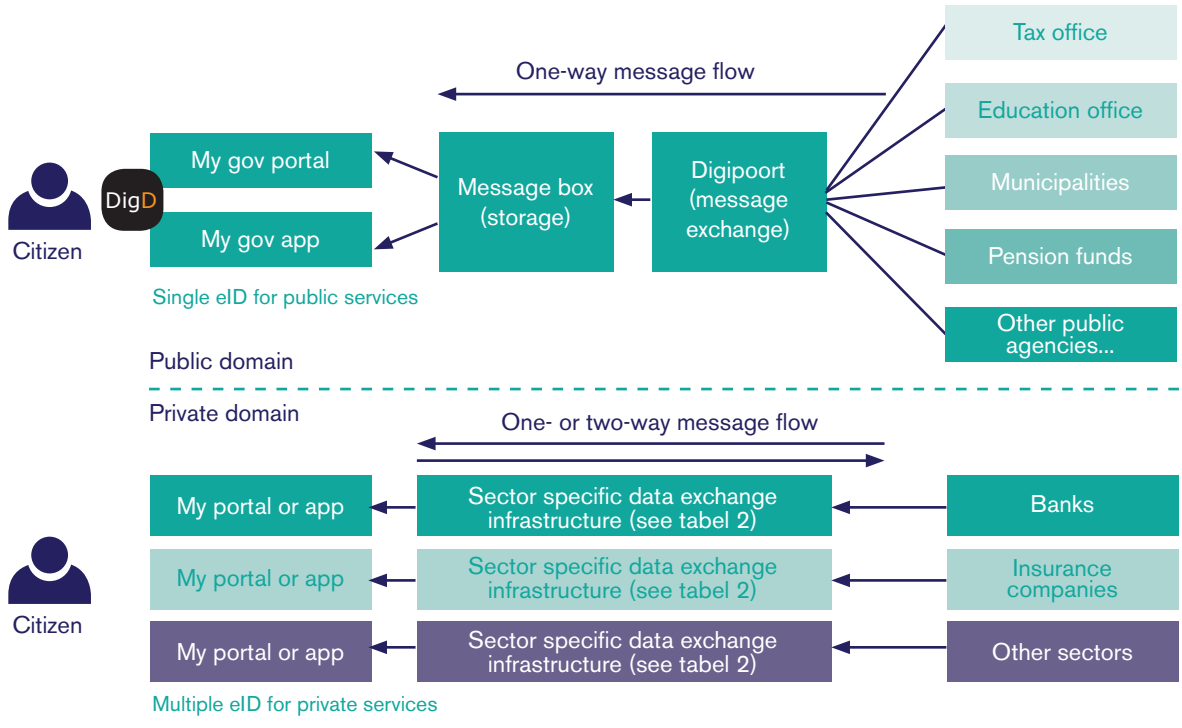

Fig. 2. High-level technical design of the Dutch data exchange infrastructures (please note that not all the different infrastructures outlined in Table 2 are displayed).

The high-level technical design of the Estonian data exchange infrastructure is sketched in Fig. 3. Estonia embraces an integrated design, which extends the technology. X-Road consists of technical, legal and organizational assets that are teamed together as described in the sequel. In a narrow sense, the data exchange infrastructure is nothing but the data exchange layer X-Road (dark grey in Fig. 2); in a broader sense, it encompasses also crosscutting services that are built on top of X-Road such as the document exchange center[26]. The data exchange layer relies on a PKI (public key infrastructure) and a time stamping service. A PKI is itself a combination of technological assets (such as the certication server) and an institution, i.e., the CA (certication authority). Next, the X-Road consists of security servers, which are software components. Each organization (public agency or private company) that wants to exchange messages over X-Road must become an X-Road member rst, by application and registration at the Estonian IT Authority RIA (Riigi Infossteemi Amet). Then, each X-Road member needs to install the security server. The basic task of the security server is to encrypt and decrypt the data exchange messages sent among the X-Road members. For this, the security server teams together with a signature device, which must be obtained from the CA by each X-Road member. Furthermore, the security server allows for access rights management: each X-Road member can determine itself, which other X-Road members can access its services. It is regulated that each X-Road member announces its information systems and services to RIA before it is allowed to launch them. This way, RIA has the chance to streamline the service oering, in particular, to enforce the the once-only principle[31]. Similarly, timestamping by the installed security servers as well as timestamping service provision are subject to regulations. All citizens can see all communications about them. This creates transparency and ensures that mistakes or fraud can be detected immediately.

The Estonian e-government ecosystem is a network consisting of different players with well-dened roles. As a fundamental task, the e-government ecosystem implements the Estonian eID[28, 32], which provides also the basis for any system interoperability, compare again with Fig. 2. The Information System Authority (RIA) and the Estonian Police and Border Guard Board (PBGB) are the main authorities in the e-government ecosystem. RIA4 operates on behalf of the Ministry of Economic Aairs and Communi-cations[5]. RIA coordinates the development and administration of the state's information system. It oversees the functioning of the Estonian PKI, organizes activities related to information security, handles security incidents that occur in Estonian computer networks, and serves as the technical eID competence centre.

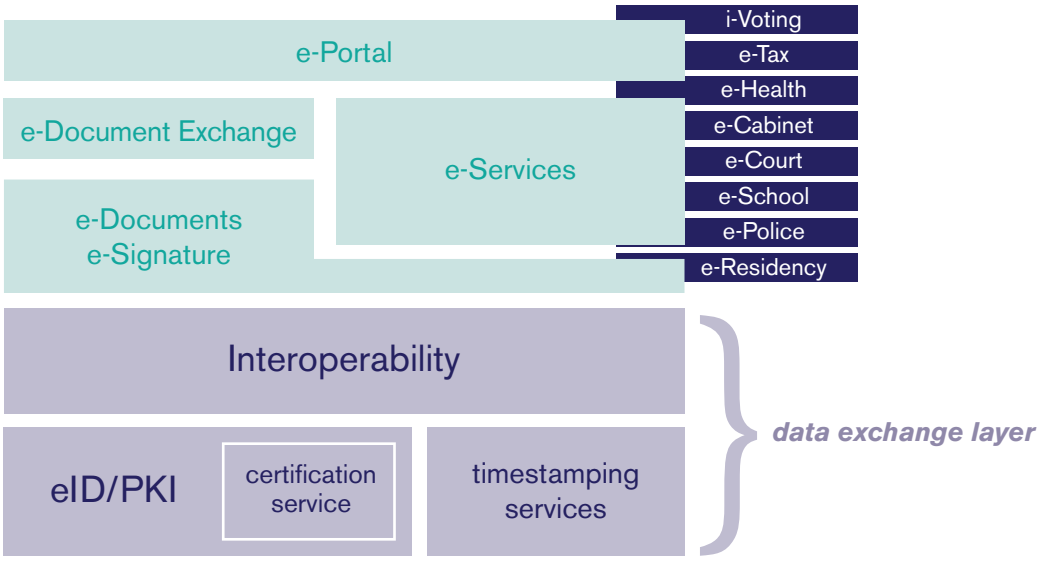

Fig. 3. High level, integrated technical design of the Estonian data exchange infrastructure.

6. Conclusions and Policy Recommendations

Estonia and the Netherlands had dierent starting points and used different paths in developing their e-government. The main dierences in approaching e-government boil down in the following categories:

- Strong centralized government institutions in Estonia versus decentralized and market-oriented institutions in the Netherlands.
- Institutional boundaries in the Netherlands between the use of state-owned digital infrastructures (or components) for public services (only allowed for citizen-to-government interactions) and semi/non-public services (not allowed for citizen-to-business and business-to-business interactions) versus no boundary in Estonia (single infrastructure, seamless use across public and private services).
- Focus on experimenting and learning by doing in Estonia, whereas the Netherlands is risk-averse and leaves innovation to the market.

These differences make it dicult to copy each other best practices as the institutional settings are dierent, and due to the dierent data exchange infrastructures that are currently in place. Nevertheless, both countries can learn from each other's approaches. The capacity of reliable institutions to meet performance expectations, perceptions of competence and eective public service delivery for all, along with public accountability, should be among the leadingconcerns in developing e-government further. It is recommended that governments exploit the potential of digital technologies through coherent national policies that are closely aligned with the knowledge of user needs that is available at the respective public agencies. Being successful requires a whole-of-government approach across ministries and agencies and between levels, as well as partnerships with non-government actors. Such an approach needs to be supported by a high-level political will, an example of which is an eective cross-government institution with clearly earmarked nancial resources and decision-making powers.This demands a shift from inward, disjointed and process-oriented organizational structures to highly collaborative frameworks for seamless delivery of services towards citizens and entrepreneurs. Maximizing the potential of digital technologies also demands appropriate data exchange infrastructures for interoperability and digital transactions across the public sector, dependent on common standards, data sharing, highly skilled staff, as well as knowledgeable organizational capacity.

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