

GOVERNMENT AS A PLATFORM: WHAT CAN ESTONIA SHOW THE WORLD?

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ABSTRACT

The concept of Government as a Platform (GaaP) is based on a digital foundation for government to share data, software and services, and has been proposed as an efficient, effective and innovative model for government, particularly in the UK. But it has come nearest to being realised in Estonia, where underlying layers of data registries, information exchange, secure identification and front-end portals form a platform upon which digital services have been built, earning a global reputation for digital government. This paper looks at the Estonian case across the seven principles of GaaP put forward by its original architect, Tim O'Reilly: openness, simplicity, participation, 'learning from hackers', data mining, experimentation, and 'leading by example'. It finds that openness, simplicity, participation and leading by example – have been core to the design – and to the success - of the Estonian digital government, prioritised over the more 'bottom-up' principles, such as experimentation, leading to a centrally driven, rational, data efficient model that has benefitted from sustained leadership. In contrast, the UK government and (from 2011) the Government Digital Service has embraced the more informal principles of experimentation, a 'hacking' culture and data mining, but has struggled with openness, simplicity and participation, and is now challenged in its central leadership role. This comparative analysis provides some possible lessons for good government (for example, in terms of citizen focus and flexibility) in both countries, and for the GaaP model itself.

Digital technologies have long been heralded as having the potential to revolutionise public administration. But in many countries, governments still strive to maximise the potential of such technologies to transform interactions with citizens and deliver efficiency savings. The associated notion of Government as a Platform (GaaP) offers to encapsulate the use of digital technologies to support the resolution of collective action problems at various levels (city, county, national, regional) through shared software, data and services — and thereby improve the efficiency and effectiveness of government and governance, doing more for less.

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Estonia has probably come nearer than any other country to realising the GaaP vision. From 1999 onwards, the government developed three ‘layers’ of the platform concept: a system of registries and data exchange that allow departments and agencies to share data (X-Road); a system of digital and mobile identification (eID) used by over 90 per cent of the population; and a service layer accessed through various portals (the largest of which is the official state portal, eesti.ee.). The digital services resting on these layers are used widely by citizens, professionals and businesses for interacting and transacting with both public and private sectors, and earned Estonia a reputation as an eGovernment leader for many years.

The United Kingdom is also pursuing the GaaP vision, principally through the Government Digital Service, a central agency created by the Coalition Administration of 2010, with responsibility for driving forward the digitization of government services and (from 2015) with specific responsibility and resources for realising the GaaP concept. Here the vision is based on a number of modules, or building blocks of the platform concept, starting with the central portal www.gov.uk where all content for the government digital presence is centralised and more recently, Verify – a federated system of identity with no card-based scheme or centrally-managed strong ID which has been used by a modest percentage of the population from 2016. Meanwhile, the complexities of legacy systems present barriers to the implementation of a seamless, “whole of government” approach. Estonia and the UK, therefore, reveal very different approaches to realising the GaaP ideal.

This paper explores the origins, goals, benefits, and limitations of the Estonian and UK approaches, including the factors behind their divergence. In so doing it draws out the lessons and insights that the Estonian approach can reveal for the UK and other nations seeking to implement their own version of GaaP. First, we introduce the notion of Government as a Platform and its connection to current debates about the development of digital government. Second, we describe the Estonian approach to GaaP along the seven principles or lessons put forward by its original architect, Tim O’Reilly. Third, we outline the UK case and draw out the comparisons between the Estonian and UK approaches. Finally, we draw out the lessons such a comparison can provide for Estonia, the UK and for the GaaP model itself.

The research for this paper was based on an analysis of secondary literature (shown in the footnotes and bibliography); policy documentation (shown in Appendix A); and interviews with a range of Estonian and UK officials, policy-makers and thought leaders (shown in Appendix B).

THE GOVERNMENT AS A PLATFORM CONCEPT

The concept of Government as a Platform (GaaP) was conceived by the US writer Tim O'Reilly as a natural progression in 'the use of technology to better solve collective action problems', where citizens have the necessary skills to solve problems at local and national levels; where governments can provide information to citizens wherever and whenever they need it; and where citizens can be empowered to spark innovation that will improve governance.¹ Building on these characteristics of contemporary technologies, he described GaaP as:

'Government stripped down to the essentials. A platform provider builds essential infrastructure, creates core applications that demonstrate the power of the platform and inspire outside developers to push the platform even further, and enforces "rules of the road" that ensure that applications work well together.'²

In this model, O'Reilly considers government as a 'convener and an enabler rather than the first mover of civic action',³ following much earlier public management reform initiatives based on Osborne and Gaebler's 1990 (pre-Internet) book *Reinventing Government*, where the mantra was 'steering rather than rowing'; there though, the emphasis was very much on public-private partnerships or voluntary provision.⁴ Rather, at the heart of O'Reilly's idea is that citizens themselves may be involved in delivering digital government, in what he sees as a "radical departure" from what Donald Kettl has described as "vending machine government", where taxes are paid in return for services⁵ and the only mechanism of citizen participation is 'collective complaint' where protests erupt when services are not delivered properly. Rather, government should develop the capacity to innovate in an "ecosystem of participation"⁶ by asking two key questions:

- How does government become an open platform that allows people inside and outside government to innovate?
- How do you design a system in which the outcomes are not determined beforehand, but evolve through interactions between government and its citizens?⁷

¹ See Tim O'Reilly (2010). *Government as a Platform*. In: Daniel Lathrop and Laurel Ruma, eds., *Open Government: Collaboration, Transparency, and Participation in Practice*. Sebastopol, Calif. O'Reilly Media. p. 14.

² O'Reilly, 2010, p. 37.

³ Ibid, p. 15.

⁴ See David Osborne, and Ted Gaebler (1992). *Reinventing government: How the entrepreneurial spirit is transforming government*. Reading, Mass.: Addison Wesley Public Comp.

⁵ See Donald Kettl (2008). *The Next Government of the United States: Why Our Institutions Fail Us and How to Fix Them*, W. W. Norton & Company.

⁶ O'Reilly, 2010, p. 15.

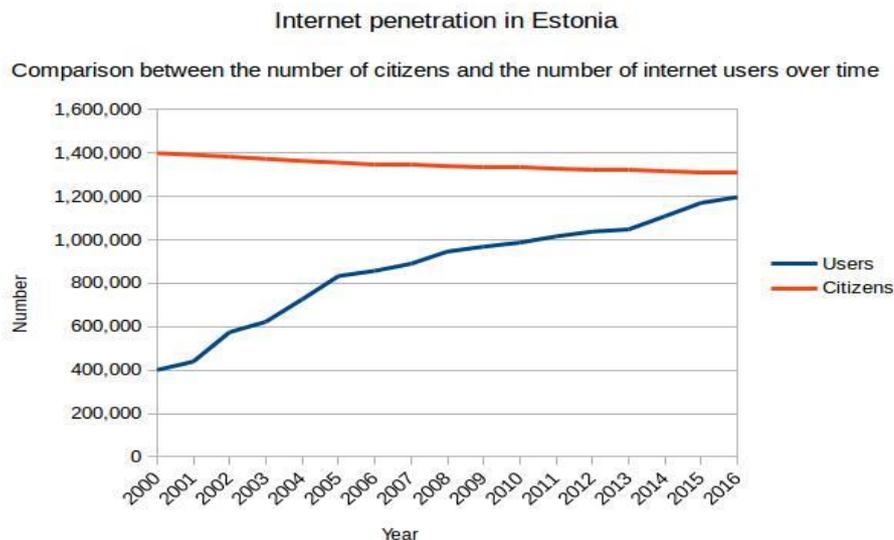
⁷ Ibid, p. 15.

By tackling these two issues O'Reilly claims that 'Government as a Platform will avoid the danger that platforms lose their power when they fail to adapt'.⁸

DIGITAL GOVERNMENT IN ESTONIA

After independence from the USSR in 1992, Estonia had virtually no digital government. But the country moved fast to develop one, embarking on a path of rapid modernisation and being 'one of the first countries in the world to draft an e-government strategy in the mid 1990s'.⁹ What legacy that remained from the Soviet Era was discarded and offers of software from other countries (including Finland) were rejected. A model of government modernisation, paperless, efficient and forward thinking emerged right from the start. The original design was motivated by the aspiration, after independence in 1991, to create a 'minimal and efficient' state¹⁰. An early programme to increase the penetration of computer technology and the internet led to the impressively early provision of Internet access and computer labs at all Estonian schools during the 1990s, which must have contributed to Estonia being ahead of the curve in terms of internet penetration; 92 % of the 1.2 million population by 2016 (see Figure 1).

Figure 1. Internet Penetration in Estonia 2000-2016.



Source: *Internet Live Stats* ¹¹

⁸ Ibid, p. 16.

⁹ See Ross O'Brien (2004). *E-government in Central Europe. Rethinking Public Administration*. [online] In: The Economist. The Economist Intelligence Unit. Available at http://graphics.eiu.com/files/ad_pdfs/Central_Europe_egov.pdf [Accessed 17.08.2016]. p. 5.

¹⁰ Kitsing, 2010, p. 6.

¹¹ <http://www.internetlivestats.com/internet-users/estonia/>.

At first glance, Estonia seems to embody the Government as a Platform concept, owing to the three layers of digital government that together form a ‘backbone’ for government services. These are:

X-Road is a system of registries whereby each has an authorised owner of the data, responsible for its maintenance and security. The system relies on a unique 16 digit personal identifier (similar to the UK National Insurance Number, but with which every citizen is issued at birth) for every person which can be used to retrieve personal data from any registry¹², as well as a number of other identifiers for businesses, properties, vehicles and so on. The result is like a peer-to-peer network, where any data in flight (that is, in transit) is encrypted.

The electronic ID (eID) infrastructure, based on PKI-based authentication and digital signatures was introduced in 2002 with the addition of a mobile ID in 2007. An electronic identity card is used as a container for the certificates. This secure system of identification and authentication means that every user of Estonian government may identify themselves to the system (through digital signatures), enabling them to access services from both public and private sectors. The eID can be used for various purposes including banking, internal applications of a company or public portals, and for signing encrypted emails.¹³

The service layer, accessed through platform eesti.ee, the official Estonian State eServices portal since 2003, and other service portals. Citizens can access more than 800 services, most of which use X-Road.¹⁴ Any citizen interacting with the service layer can see who has accessed (and why) data that relates to them when they log on, as there is an audit trail of all accesses and changes to the data.

There are clear central mechanisms for the development and maintenance of digital government. There is a Central Information Officer (CIO) operating at the political strategic level, a role which was shifted to the Ministry of Economic Affairs in 2003, but was moved back to the Cabinet Office in 2012. The basic infrastructure – X-Road, eID and the official state portal eesti.ee - are managed and developed by the Estonian Information Service Authority, a central agency with about 120 personnel. The digital services are developed by departments and agencies with responsibilities for each service, but to access X-Road and the data registries, each department must seek approval from the Information Service Authority through their RIHA meta-information system. Estonia cleared the way legally for these developments with identification and digital signature acts giving them the same weight as paper signatures in 1999 to 2000: ‘The state standardized a national Public Key Infrastructure (PKI), which binds citizen identities to their cryptographic keys, and now doesn’t care

¹² There are other unique identifiers for properties, cars, businesses and so on.

¹³ See eGovernance Academy (2016). *e-Estonia: eGovernance in Practice*, [online] Available at <http://ega.ee/wp-content/uploads/2016/06/e-Estonia-e-Governance-in-Practice.pdf> [Accessed 17.08.2016]. p. 15.

¹⁴ eGA, 2016, p. 9.

if any Tiit and Toivo (to use common Estonian names) sign a contract in electronic form with certificates or plain ink on paper. A signature is a signature in the eyes of the law.’¹⁵

The early introduction of the three layers mean that for almost all public services, there is a long tradition of digitalization, with digital services established across different public sectors over the years. These include¹⁶ e-Police (from 2005), which provides communication and co-ordination for police services; and e-Business (2007) that links to a data registry of all legal entities registered in Estonia, and includes a portal that allows online Company Registration for new businesses and non-profits. Some of these services are specifically for professionals to use – such as eNotary, an online platform for notaries to allow them to prepare agreements and communicate with state agencies – while some are for all citizens, such as i-Voting (from 2005) which allows voters to cast ballots online from any location. The eHealth system integrates data from different healthcare providers to provide a comprehensive record for each patient that can be viewed by both doctors and patients (through the Patient Portal). One of the most widely used digital services is eSchool, the most successful example of private provision, which provides three way communication channels between parents, teachers and children and allows parents to play an active role in their children’s learning.

These three pillars are at the heart of Estonia’s high reputation for digital government, particularly X-Road which featured (for example) in the World Economic Forum Future of Government ‘Smart Toolbox’ report¹⁷ in 2014. X-Road connects more than 1,700 services, 900 public and private organisations, registries and databases, processes more than 500 million transactions per year, and receives more than 1 million requests per day.¹⁸ There are many misconceptions about what is so important about X-Road; as one interviewee observed, the system is often seen as centralised, when in fact its most important feature is that it is a completely distributed system, where people own their own data, and ‘some can not work and the rest will’¹⁹. Another suggested ‘X-Road is just a methodology, it is does not solve any problems, just the one of how we can exchange information. Without that, it is like saying please build me a car but you can’t use wheels.’²⁰ The layers are

¹⁵ See Sten Tamkivi (2014). Lessons from the World's Most Tech-Savvy Government. An Estonian shares his country's strategy for navigating the digital world. In: *The Atlantic*. [online] Available at: <http://www.theatlantic.com/international/archive/2014/01/lessons-from-the-worlds-most-tech-savvy-government/283341/> [Accessed 17.08.2016].

¹⁶ eGA, 2016, p. 7.

¹⁷ See World Economic Forum (2014). Future of Government Smart Toolbox. [online] Available at: http://www3.weforum.org/docs/GAC/2014/WEF_GAC_FutureGovernment_SmartToolbox_Report_2014.pdf [Accessed 30.08.2016].

¹⁸ eGA, 2016, p. 59; Information Systems Authority (2016). Statistics about the X-Road. [online] Data Exchange Layer X-Road. Available at: <https://www.ria.ee/en/statistics-about-x-road.html> [Accessed 30.08.2016].

¹⁹ Interview, NNth September 2016.

²⁰ Interview, September 30, 2016.

interdependent; X-Road would not work without eID²¹, the national identification system of secure and reliable public key infrastructure (PKI) and the national population register based on the unique personal identifier as a “major institutional precondition” for electronic identification: ‘if you don't know who is sitting behind the computer, you can't have e-services²². The services are secured and as the data is encrypted when in transit, ‘even if you steal it, you can't read it’. Around 1.1 million citizens have an eID, around half of which are actively using it at least once a month. Around 100,000 are using the newer mobile ID, which is based on an applet on a SIM card.²³ The Tax and Customs Board seems to have been particularly impressive in terms of digital delivery, with conscious development of a culture of service provision and a customer-centric view, to the extent that ‘Estonians love their tax office’²⁴ and by 2016, over 98% of returns come via the eTax Board.

E-government rankings are well known for their methodological weaknesses and inconsistencies²⁵, and Estonia's place in international rankings has not reflected the country's reputation, for example scoring a rank of 15 on the UN world e-Government leaders index in 2014,²⁶ but these rankings include many other elements outside eGovernment (such as business and innovation environment) and when public services or infrastructure are singled out, Estonia has consistently done well in indicators like the ‘social impact of ICTs in public services’, as in the World Economic Forum network readiness index²⁷. Estonia featured in first place in the 2016 Digital Public Services index of the European Commission's Digital Progress Report and a graphic created from the data there shows well the distinctive features of Estonian digital government compared with both the UK and the European average²⁸, with particularly impressive scores for ‘key enablers’ reflecting the long-standing success of the three key GaaP elements: X-Road, eID and the government portal.

²¹ See Kristjan Vassil (2015). Estonian e-Government Ecosystem: Foundation, Applications, Outcomes. In: *World Development Report 2016*. [online] Available at: <http://pubdocs.worldbank.org/en/165711456838073531/WDR16-BP-Estonian-eGov-ecosystem-Vassil.pdf> [Accessed 16.08.2016]. pp. 3-4.

²² Interview, July, 2016

²³ O'Brien, 2004, p. 14.

²⁴ Interview, August 30, 2016

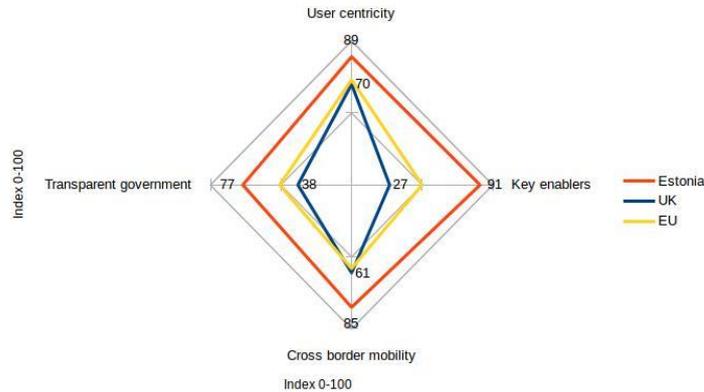
²⁵ Dunleavy et al, 2002, *Government on the Web 2*; Dunleavy, Margetts et al, *Digital Era Governance*, 2006.

²⁶ https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2014-Survey/E-Gov_Complete_Survey-2014.pdf.

²⁷ <http://reports.weforum.org/network-readiness-index/>.

²⁸ See European Commission (2016). European Digital Progress Report (EDPR) country reports 2016. [online] Digital Single Market. Available at: <https://ec.europa.eu/digital-single-market/en/download-scoreboard-reports> [Accessed 30.08.2016].

Figure 2. eGovernment performance across policy priorities: Comparison between the UK, Estonia and EU average, 2014



Source: Data from eGovernment benchmark country profiles of Estonia and the UK.²⁹

While the central platform enablers are centrally maintained and developed, the service layer is more heterogeneous, with suggestions that some services have become outdated or unco-ordinated³⁰. As one interviewee pointed out, the Information Systems Authority, while having control over the platform layers, plays no role in the development of eServices: departments and agencies ‘can use carrier pigeons if they want’.³¹ There is some concern over the official State portal, which centralises all content and can have problems when a department changes their business processes without informing the Information Systems Authority. There is an aim to move more towards a ‘many portal’ model³², with a more distributed approach for developing content while authentication and some other shared services (such as payments) remain centralised. The very few analytical critiques of the success of the Estonian eGovernment³³ (such as Kitsing, 2010)³⁴ rest on the argument that Estonia’s approach to eGovernment is not scalable and the success has been mostly driven by the socio-economic and demographic conditions of the country (population size, historic necessities, limited resources)³⁵ and the fact that there were no legacy systems in place.

²⁹ See European Commission (2014). EU eGovernment Report 2014 - Country Factsheets E-Government (2014). [online] Digital Single Market. Available at: <https://ec.europa.eu/digital-single-market/en/news/scoreboard-2014-country-factsheets-e-government> [Accessed 30.08.2016].

³⁰ Where Stuff Happens First, p. 9; Kitsing (2010).

³¹ Interview, August 12, 2016.

³² Interview, September 30, 2016

³³ See Tarmo Kalvet (2012). Innovation: A factor explaining e-government success in Estonia. *ResearchGate*, [online], pp. 142-157. Available at: https://www.researchgate.net/publication/235347972_Innovation_A_factor_explaining_e-government_success_in_Estonia [Accessed 17.08.2016]. p. 144.

³⁴ See Meelis Kitsing (2010). An Evaluation of E-Government in Estonia. Prepared for the Internet, Politics and Policy 2010: An Impact Assessment conference at Oxford University. [online] Available at http://ipp.oii.ox.ac.uk/sites/ipp/files/documents/IPP2010_Kitsing_1_Paper_0.pdf [Accessed 17.08.2016].

³⁵ Ibid, p. 7.

Overall, however, Estonia looks like a success story, where decisions were taken and models employed that crucially shaped the kind of digital government that emerged. Estonia was early to recognise what has finally become widely accepted; that it is a mistake to think that eGovernment mainly revolves around technological issues. In 2006 the eGovernance Academy published a study arguing that the ‘main expenses are related not to technology but to organisation, reforms of processes and the implementation of tools’³⁶, with the most important elements being political will; organisational reforms; adaptation of legal frameworks; and redesign of work processes.³⁷ In the next section, we explore the extent to which the principles of GaaP were applied, and the extent to which these might be viewed as responsible for Estonia’s success.

DO THE GAAP PRINCIPLES APPLY TO THE ESTONIAN CASE?

Government as a Platform has never been an explicit model in the development of Estonian digital government, even after O’Reilly’s article, although some policy-makers now use the phrase when they talk about Estonia abroad. But it is clear in discussion with policy-makers that the way they view the system is very reminiscent of the platform approach, with ‘interoperable infrastructure’ replacing platform in their thinking: ‘the thinking has been the same without the concept’³⁸. So, in many ways through X-Road, eID and the service layer Estonia seems to have pursued the Government as a Platform model, just with a different rhetoric. So to what extent do O’Reilly’s principles seem to have been applied here – and which were given more emphasis? If the platform approach is coherent and sustainable – then any principles that were not applied might offer a signpost for Estonia’s future development of their digital government, while those that have contributed to success might provide useful lessons to other countries, such as the UK.

1. Open Standards spark innovation and growth

According to O’Reilly, platforms that generate the highest economic activity are the ones that are the most open, where decentralisation and low entry barriers for participation make it easy for users and developers to add value to the existing platform, while open standards encourage new innovation.³⁹ Open standards allow interoperability between different services and products which in turn

³⁶ eGA, 2006, p. 3.

³⁷ Ott, 2014, p. 3.

³⁸ Interview, August 12, 2016.

³⁹ O’Reilly, 2010, pp. 17-18.

consolidates openness of each service and product.⁴⁰ At the same time, openness has to find the right balance between control and *generativity* in order to create value for users and developers alike:⁴¹

1. open standards foster innovation: low barriers for entrance spur innovation, high barriers prevent innovation
2. vibrant platforms become less generative over time because the platform vendor begins to compete with the developer ecosystem (see Microsoft).

Openness as an element of the GaaP concept can be expressed through open source software, open API's, and open systems based on rules for cooperation and interoperability.⁴² The time since O'Reilly wrote, however, has seen a big growth in open government data initiatives, where government data is released for open use, with the aims of fostering enterprise and innovation; and of increasing transparency and accountability of government to citizens⁴³, which has brought a change in emphasis in the way the term 'open' is used in many governments.

Estonian experience: Openness is often emphasized in the documentation of the Estonian approach, perhaps originating in a reaction against the closed nature of the Soviet regime from which Estonia was emerging. For example, Daniel Vaarik claims that eGovernment in Estonia is 'open by design' and that initiatives are built around four core values of 1) decentralisation, 2) interoperability, 3) open platform, and 4) an open-ended process.⁴⁴ Open standards are widely used across all government departments, and the Ministry of Economic Affairs and Communications (MEAC) provides a comprehensive list of all open standards that are being currently used⁴⁵, including an agreed minimum set of open standards which the public sector must follow when information systems are created⁴⁶. The interoperability platform X-Road is based on open standards⁴⁷, is written in open source code and the source code and all files that are needed to create the X-Road environment are on GitHub,^{48,49}

⁴⁰ Ibid, p. 18.

⁴¹ Ibid; Zittrain, 2010.

⁴² O'Reilly, p. 24.

⁴³ See Amanda Clarke and Helen Margetts (2014). Governments and Citizens Getting to Know Each Other? Open, Closed, and Big Data in Public Management Reform. *Policy & Internet*, 6(4); Jonathan Bright, et al. (2015). Explaining usage patterns in Open Government Data: the case of Data.gov.uk. *Oxford Internet Institute* [online], pp. 1-22. Available at: <http://www.icpublicpolicy.org/conference/file/reponse/1433323028.pdf> [Accessed 29.08.2016].

⁴⁴ See Daniel Vaarik (2015). Where Stuff Happens First. White Paper on Estonia's Digital Ideology. [online] BDA Think tank of the President of Estonia. Available at: https://www.mkm.ee/sites/default/files/digitalideology_final.pdf [Accessed 30.08.2016], p. 6.

⁴⁵ See The Ministry of Economic Affairs and Communications (2011). Interoperability of the State Information System. Framework Version 3.0. [online] Available at: https://www.mkm.ee/sites/default/files/interoperability-framework_2011.doc [Accessed 30.08.2016]. p. 33.

⁴⁶ Ibid, p. 34.

⁴⁷ Ibid, p. 8.

⁴⁸ See Github (2016). X-Road. [online] Available at: <https://github.com/vrk-kpa/xroad-public> [Accessed 19.08.2016].

⁴⁹ eGA, 2016, p. 61.

Developers take responsibility for integrating services into X-Road, and in this way interoperability is ensured.

This principle, then, was important, with the existence of X-Road providing a solid foundation for openness and innovation, but it is a distinctive vision of openness, strongly related to a high commitment to security, which in turn incentivizes participation:

‘Naturally, this **open design** [of X-Road] is accompanied by rigid security measures – authentication, multilevel authorization, high-level log processing and monitoring, encrypted and time stamped data traffic – the basic functionalities that are covered within the very structure of X-Road. As a result, Estonian state institutions are structurally incentivised to join the X-Road, simply because they can design services that would not be as efficient and convenient to develop and maintain individually.’⁵⁰

Estonia, was the target of the ‘cyberwar’ of 2007, when denial-of-service attacks brought down the websites of the Estonian parliament and other government agencies, banks, newspapers, and broadcasters, and the connection to the outside world was deliberately cut off for several hours to prevent the excess traffic, successfully isolating the attacked services from other parts of the network thereby preventing further harm or a complete shutdown. Estonia accused Russia of the attacks, while Russia denied involvement.⁵¹ Later, possibly influenced by these events, the NATO Cooperative Cyber Defence Centre of Excellence was established in Tallinn⁵² and President Toomas Hendrik Ilves became one of the most vocal cyber security advocates on the world stage⁵³.

This commitment to security as a prerequisite to the openness principle is in contrast to other countries including the UK, where the emphasis is on open data initiatives, meaning that data is *either* open, or secure. Indeed, we found little attention paid to the phenomenon of open data in Estonia and one interviewee suggested that ‘open data ideology only works in big countries’ and that ‘open data is so last century’.⁵⁴ Instead, the Information Systems Authority has proposed an ‘API First Government’⁵⁵ approach (drawing on Singaporean initiatives to integrate transactional APIs with an open data ideology), based on ‘integral open APIs’ rather than ‘bolt-on open data’ as in the UK, where recent work has suggested that the use of open data for transparency and opening up government to citizens is in practice disappointing.⁵⁶

⁵⁰ Vassil, 2015, p. 13.

⁵¹ Anthes, 2015.

⁵² Vaarik, 2015.

⁵³ Interview, August 30, 2016.

⁵⁴ Interview, September 30, 2016

⁵⁵ <http://www.slideshare.net/AndresKtt/api-first-government>

⁵⁶ Clarke, Margetts, 2014; Bright, 2015.

2. Build a simple system and let it evolve

This principle is based on the idea that ‘government should focus on creating a simple, reliable and publicly accessible infrastructure that “exposes” the underlying data.’⁵⁷ ‘Build a simple system and let it evolve’ means that you design and develop foundations that others can build on.⁵⁸ O’Reilly stresses that creating a starting point is crucial in order for others to reuse and extend:

‘A complex system that works is invariably found to have evolved from a simple system that worked. The inverse proposition also appears to be true. A complex system designed from scratch never works and cannot be made to work. You have to start over beginning with a working simple system.’⁵⁹

Estonian experience: Most of all the GaaP principles, the Estonian approach embodies the idea of simplicity. Drivers towards simplicity that emerge from interviews include the small size of the government and the lack of resources, which meant that the solution had to be simple; ‘we did not have the resources to do anything complicated’ and ‘you can scale up from something simple’⁶⁰, almost seeing to quote O’Reilly unconsciously. Of course, as noted above Estonia has the advantage that it is a small and rather homogeneous society and was able to avoid the complex digital legacy of countries like the UK and US. But on top of these natural advantages the approach was from the beginning one of simplicity: ‘Estonians started by redesigning their entire information infrastructure from the ground up with openness, privacy, security, and ‘future-proofing’ in mind.’⁶¹ One observer made it clear that this was not just about building the information infrastructure, but the entire government from the ground up based on these principles: ‘The information system is nothing but an expression of the underlying strategy’⁶².

Simplicity is maintained through the highly ‘data-efficient’ design of X-Road, which means that there are no duplicated databases, no ‘version control’ problems with data. As one interviewee put it:

‘unless you have information sharing between silos, they are forced to collect information themselves, so all create databases, you end up with 100 copies of the same data, and the agency with the most data becomes the most powerful. Then there is going to be a breach, which will lead to distrust

⁵⁷ O’Reilly, p. 23.

⁵⁸ Ibid, p. 21.

⁵⁹ Ibid.

⁶⁰ Interview, August 2016.

⁶¹ Tamkivi, 2014.

⁶² We thank an expert reviewer for this point.

between agencies, and they are even less likely to share data'. So X-Road was explicitly designed to avoid these barriers: "There is no or little coordination between all open governance mechanisms. The coordination is all in the design of the system itself."⁶³ Another key driver for simplicity was a 'clearing of the legislative path' for the development of the three platform layers, noted above. It was recognised from the start that it would be difficult to get departments to share data, and that legal authority would have to be used to ensure that data was gathered only once.⁶⁴ So, if a new public service is developed, it is legally (under the Public Information Act) not permitted to design systems that store the same data in different repositories.⁶⁵ These requirements underpin the interoperability and interconnectedness of the digital architecture, and the President himself has emphasised that data exchange innovation cannot work without "enabling legislation"⁶⁶

Simplicity is further reinforced through the theme of 'digital by default' in service delivery, a concept which only gained currency in other countries from around 2010, but was important in Estonia from the start, although the phrase appears explicitly only around 2012: "Some of Estonia's core principles include asking for information online once, having services available 24/7, being digital by default."⁶⁷⁶⁸⁶⁹. Complex (and expensive) multi-channel options were avoided. Just as X-Road was compulsory for government agencies, eID is compulsory for citizens to interact with many government services. Early mandation of electronic tax filing in the 1990s must have contributed to the almost universal rate of electronic filing today.

3. Design for participation

Following the GaaP model means that systems have to be designed from the very beginning as systems of participation. Simplicity and participation are closely connected: "Participatory systems are often remarkably simple".⁷⁰ O'Reilly's idea here is to design systems and the supporting infrastructure that will enable the citizens to do most of the work⁷¹ – or what Dunleavy and Margetts call 'isocratic administration', where citizens take charge of their own affairs.⁷²

⁶³ Ibid.

⁶⁴ Vassil, 2015, p. 5.

⁶⁵ Vassil, 2015, p. 6.

⁶⁶ <https://www.youtube.com/watch?v=mvKSRHPgkd4>.

⁶⁷ See Derek du Preez (2016) Estonia – an example of what's possible in digital public service delivery. [online] Diginomica. Available at: <http://diginomica.com/2016/04/22/estonia-an-example-of-whats-possible-in-digital-public-service-delivery/> [Accessed 17.08.2016].

⁶⁸ Kalvet, 2012, p. 143.

⁶⁹ du Preez, 2016.

⁷⁰ O'Reilly, 2010, p. 24.

⁷¹ Ibid, p. 26.

⁷² Margetts, Dunleavy, 2008, p. ??.

Estonian experience: One drive towards participation in Estonia comes in part from the context of 1992, where the emergence from the USSR gave Estonian citizens a sense of ‘our government’, which they had retrieved from the USSR, moving a way from a sense of ‘government ruling us’ or being against the people. One interviewee described how this atmosphere engendered enthusiasm for the early plans for eGovernment, with eID cards viewed as ‘modern and innovative’⁷³.

So from the beginning, the aim of the first Estonian Information Society Strategy was to develop a citizen-centric and inclusive society’, including moves to improve household internet penetration to be 88 percent in 2015.⁷⁴ The emphasis throughout was on ‘Citizen as Principal (“as the driver”’, very reminiscent of the GaaP ideal:

‘In a way (in e-Estonia) the government and the public sector is serving you and you are on the driver's seat. Or more so than in other societies. The citizen is a subject and not an object of government.’⁷⁵

As noted above, a key element of the X-Road system and the portal to access it is that citizens ‘own’ their data, and can view and to some extent control who accesses their data on X-Road, a crucially participative characteristic of the system. As one interviewee put it ‘people are ‘afraid of things they can’t see’⁷⁶, but with the population registry and other registries, they can see exactly who has had access to their data, which is reassuring. All these factors have meant that in spite of what looks from the outside like a centralised system of eGovernment using ID-cards, there has never been any concerted opposition or resistance, or privacy lobby (in strong contrast to the UK).

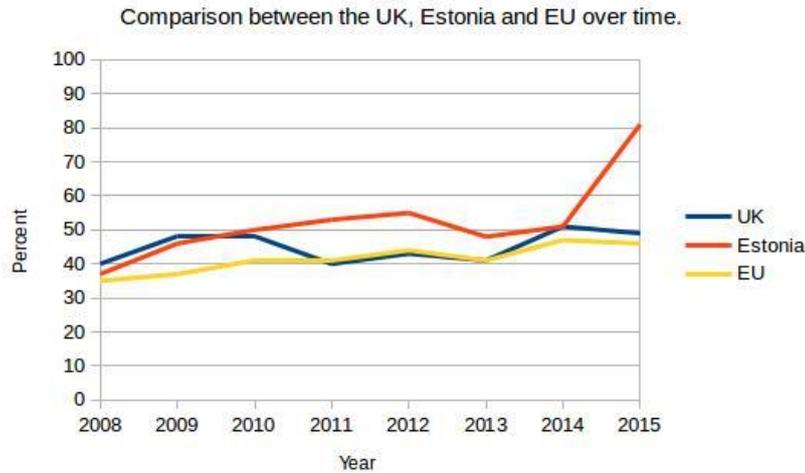
Figures for participation rates in Estonia are impressive; as Figure 3 shows, Estonia has consistently had higher proportions of citizens interacting with public authorities than the EU average, and by 2015 this figure was 30% over that for the UK.

⁷³ Interview, September 2016.

⁷⁴ See OECD Data (2016), Access to computers from home. [online] Available at <https://data.oecd.org/ict/access-to-computers-from-home.htm> [Accessed 17.08.2016].

⁷⁵ Vaarik, 2015.

⁷⁶ Interview, August 12, 2016

Figure 3. Individuals using the internet to interact with public authorities.

*Source: Eurostat data from 2016.*⁷⁷

The driving up of participation used both carrots as well as the sticks discussed above. By 2006 the usage of eID cards was 3%, but a special initiative to drive up participation, with provision of training days and public computers with card readers attached, drove this to 300,000 in 3 years. The real rise in uptake, however, was driven by the realisation of the two major (Swedish-owned) banks that the eID infrastructure could provide a better and cheaper service than their own cumbersome security infrastructure of PIN codes and passwords, so they had a campaign to move people over to the eID system, for example by reducing the limit of the value of transactions that could be carried out via the old system. Ultimately, they came to trust the eID more than their own systems. This was hugely important, because ‘people do banking very week, whereas the average citizen uses government services between 1 and 3 times a year’, and they would not have bothered to get a smart code reader or learn how to use the services for that. In the early days of the eID, there was a lot of talk about the card being ‘a useless ice scraper for my car’, so it was banks that drove the process. As one interviewee put it, ‘we did it together with our banks – we don’t even have a separate identification system now’⁷⁸. Certainly the unique personal identifier, a number designed from the ground up to be used across both public and private sectors⁷⁹, something so elusive in the UK, has been key to driving up participation in services.

⁷⁷ See Eurostat (2016). Individuals using the internet for interacting with public authorities. [online] European Commission. Available at: <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do> [Accessed 30.08.2016].

⁷⁸ Interview, August 10, 2016.

⁷⁹ <https://www.ria.ee/riigiarhitektuur/blog/author/andreskytt/>.

4. Learn from your “hackers”

O'Reilly argues that the “secret of generative systems” is that “fundamental technological breakthroughs are often not exploited by the creators, but by the second generation of entrepreneurs who put it to work”.⁸⁰ Since that time, with the development of so-called Web 2.0, social media and user-generated content, the ‘entrepreneurs’ might be citizens themselves. Eric von Hippel describes a phenomena where “lead users” are breaking the rules and push the product to its limits, while other authors have argued that such applications might allow citizens to ‘enter the front office’ (Dunleavy and Margetts, 2008).⁸¹

Estonian experience: The early days of digital government in Estonian were clearly innovative, even world-leading, involving both banks and private sector organizations:

‘To accelerate innovation, the state tendered building and securing the digital signature-certificate systems to private parties, namely a consortium led by local banks and telecoms. And that's not where the public-private partnerships end: Public and private players can access the same data-exchange system (dubbed [X-Road](#)), enabling truly integrated e-services.’⁸²

But to what extent was there a second generation of entrepreneurs ‘breaking the rules and pushing the product to its limits’? There seems to be less discussion of this principle in action, for example a ‘hackathon’ type of movement playing around on the platform and developing new service applications, as characterised the early days of the Government Digital Service in the UK (see below).

In contrast, this seems to be a top-down design, supported by political will and leadership, sustained through central agencies, policy and strategic advisors and thought leaders from the centre of government. From as early as 2001, the ‘political will to establish a paperless society was expressed through the creation of an eCabinet’, a system of government sessions where ministers prepare and conduct cabinet meetings without paper, making Estonia the first country in the world not to use any paper in cabinet meetings, or to prepare legislation on paper at any stage, reducing the average session time from 4-5 hours to 30-90 minutes according to some sources⁸³ but also sending a crucial early message to the rest of government that digital interaction was the way forward. Now, ‘if the Prime Minister sees papers on the table he gets rid of them’⁸⁴. This political leadership was mirrored in the

⁸⁰ O'Reilly, 2010, p. 30

⁸¹ Ibid, p. 30.

⁸² Tamkivi, 2014.

⁸³ eGA, 2016, p. 12.

⁸⁴ Interview, August 12, 2016.

administration, where one interviewee suggested: ‘it is important that the central IT unit is above the others in the hierarchy – if it is one among many – there needs to be very strong leadership to challenge and to drive things forward’.⁸⁵ Although there are innovative developments, discussed below, it was not clear that this was the ‘second generation’ (indeed Cybernetica, the company that developed X-Road, is now working on Sharemind, the new data analytics platform), nor that citizens were being ‘invited into the front office’.

5. Data mining allows you to harness implicit participation

Modern digital systems use the information that users create when interacting with the service to improve policy-making and service delivery. Users leave traces behind that can be used to understand user behaviour in order to improve existing or design new services,⁸⁶ thereby participating in an unconscious way. What O’Reilly described as data mining in 2010 is developing into the field of data science and big data analytics today, where large-scale real-time transactional data is used to understand citizens needs, preferences and behaviour and the resulting insight used to improve policy-making. Although governments have lagged behind corporations and other organizations in developing data science methods⁸⁷, the potential is clear.

Estonian experience: The Estonian government ‘aims to increase its capacity to use data analytics to “exploit” data efficiently to the advantage of the public sector’.⁸⁸ But the very things that help to make Estonia a leader in digital government – such as small size and homogeneity – can actually be a disadvantage when it comes to big data. There is a sense in the way that X-Road is designed, with secure registries pointing to single distributed sources of data that can work against big data analytics, particularly given the requirement for citizens to be able to see exactly which organizations have accessed their data and for what purpose: two interviewees suggested that there are ‘legal barriers to data analytics’⁸⁹. The issue is that of organisational boundaries. Since an organisation does not have control of all the data they cannot analyse it at will – data crossing organisational boundaries is subject to legal and organisational scrutiny and restrictions which can be a barrier to analytics; the registries are separated by organisational boundaries explicitly to *prevent* non-transparent linking of random data

⁸⁵ Interview, August 12, 2016.

⁸⁶ O’Reilly, 2010, p. 33.

⁸⁷ See Bram Klievink, and Bart-Jan Romjin, and Scott Cunningham (2016). Big data in the public sector: Uncertainties and readiness. *Information Systems Frontiers*, 10.1007/s10796-016-9686-2, pp. 1-17. [online] Available at: <http://link.springer.com/article/10.1007/s10796-016-9686-2> [Accessed 30.08.2016].

⁸⁸ Ott, 2014, p. 12; Digital Society Strategy 2020.

⁸⁹ Interview, August 12, 2016.

sources. The entire system (technical, legal, process, organisational and so on) is designed to make analytics subject to scrutiny and certain barriers.⁹⁰

The Ministry of Economics has now given €5 million for government organizations to introduce training in data science and open data. There is a new proposal to make it mandatory that any new public IT procurement builds in the use of data science, for example to base services on user data, by logging individuals' behaviour in the system and monitoring troughs and peaks in usage. It would be a little like Google Analytics, with a central repository for government data (or 'data vaults', which would pull records together in a duplicate database), which would be private (rather than open) and would provide more valuable data than just analytics. Meanwhile, Cybernetica, who developed X-Road, are developing a system called Sharemind, which develops a way to allow the analysis of confidential data in encrypted form (hence completely anonymised), thereby creating the ability to do state-wide analysis, including potentially data from private firms such as banks, while still preserving privacy.⁹¹ The components are already developed and have the approval of the data protection authority, the approach has been explained and envisioned in a PhD thesis from the University of Tartu⁹², and the system is being prototyped now.⁹³ Meanwhile, data science researchers can apply to the Data Inspection Authority and the owners of data registries (both public and private) to have access to anonymised data (for example to do health research), but there are few examples as yet⁹⁴.

6. Lower the barriers to experimentation

Traditionally government bureaucracy, characterised by formality and officialdom, has been resistant to experimentation. As O'Reilly put it, government programs are usually designed to provide one possible right answer, assuming that the specifications of the project developed by the team are correct.⁹⁵ However, since the advent of the internet, web-based companies have learnt to embrace failure, experimentation and rapid iteration: 'One of the advantages of web-based business models is the ease of experimentation'.⁹⁶ The principle of experimentation requires 'a new approach to the design of programs, not as finished products [...], but as ongoing experiments'.⁹⁷ 'government platforms must be designed not as a fixed set of specifications, but as open-ended platforms that allow

⁹⁰ We are grateful to an expert reviewer of an earlier draft for this insight.

⁹¹ Interview, 1 August 2016; <https://sharemind.cyber.ee/>.

⁹² <http://dspace.ut.ee/handle/10062/50510>.

⁹³ Interview, August 30, 2016

⁹⁴ Interview, August 30, 2016.

⁹⁵ O'Reilly, 2010, p. 35.

⁹⁶ Ibid, p. 36.

⁹⁷ Ibid, p. 36.

for extensibility and revision by the marketplace.⁹⁸ Such an approach ‘empowers’ employees to ‘fail forward fast’⁹⁹ and indeed, technology giants like Google expect at least one fifth of their new projects to fail. The principle of experimentation has been popularised by Thaler and Sunstein’s by now world famous book¹⁰⁰ *Nudge*, claiming that people can be ‘nudged’ towards socially optimal modes of behaviour, such as eating more healthily or recycling, through manipulation of the ‘choice architecture’, as supermarkets do through certain kinds of product placement in their stores. Some governments have used this approach by introducing explicit experimentation, in the form of Randomised Control Trials (RCTs), where an intervention (such as making it visible whether people are recycling) is randomized and the effect on people’s own recycling behaviour is measured. This approach has been developed extensively by the Behavioural Insights Team created in the UK Prime Minister’s Office in 2010, and such experimentation could be built into digital platforms and improve the design of digital government¹⁰¹.

Estonian experience: Estonia has certainly been innovative and entrepreneurial, embodied in the idea of eResidency. This allows citizens from anywhere in the world to opt to be an eResident of Estonia, allowing them to start a business, based on the idea that:

- ‘Network is the new Leviathan as opposed to the state. The new state would be a network, not a geography. When you have a potential to opt into the country that you want to be part of as opposed to it being the function of where you live....’¹⁰²

After the UK referendum to leave the EU in 2016, the Estonian government set up a website targeting UK citizens in search of ways to keep EU citizenship, and the eResidency programme experienced high demand: ‘Since the Brexit vote, the number of UK residents applying for the program has increased by a factor of 10’.¹⁰³ Fintech executives and firms are particularly keen, because ‘they want an EU entity for passporting and the Euro to avoid currency fluctuations’. As interest in the program surged, the government created a landing page aimed at the UK: howtostayin.eu.¹⁰⁴

⁹⁸ Ibid.

⁹⁹ Ibid.

¹⁰⁰ See Cass Sunstein, and Richard Thaler (2008). *Nudge. The politics of libertarian paternalism*. New Haven: Yale University Press.

¹⁰¹ See Patrick Dunleavy, and Helen Margetts (2015). Design principles for essentially digital governance. In: *111th Annual Meeting of the American Political Science Association*. [online] San Francisco: American Political Science Association, pp. 1-32. Available at: <http://eprints.lse.ac.uk/64125/1/Essentially%20Digital%20Governance.pdf> [Accessed 30.08.2016].

¹⁰² Vaarik, 2015.

¹⁰³ See Jenny Anderson (2016). Tallinn calling. One way to get around Brexit: Become an e-resident of Estonia. [online] Quartz. Available at: <http://qz.com/736004/one-way-to-get-around-brexit-become-an-e-resident-of-estonia/> [Accessed 30.08.2016].

¹⁰⁴ See Republic of Estonia (2016). How to stay in – manage an EU company from the UK. [online] Available at: howtostayin.eu [Accessed 28.08.2016].

We did not, however, observe any deliberate move towards experimentation. We were not told of failing projects, nor did we observe examples of nudge type experimentation. As noted above, in many ways the success of X-road and eID are based on leadership from the centre, mandating departments and agencies to follow the ‘rules of the road’: as one interviewee observed, ‘it is very difficult to do Randomized Control Trials (RCTs) under this model’.¹⁰⁵ No course of action for behavioural insights research has been agreed at the centre, and there was a general view of a need to ‘prioritise’, to ‘get the basics right’ and to focus on new initiatives in data analytics such as ‘Sharemind’ (see above).

7. Lead by example

The traditional view of government is that the culture of the state is resistant to innovation: bureaucrats have little incentive to innovate, given the lack of competition or profit surrogates. In contrast, in his final principle, O’Reilly argues that a platform provider needs to show the users what can be done with the platform:¹⁰⁶ developing compelling applications in order to illustrate users and developers the potential application of the platform itself. Leadership must chose between incremental change and a revolution that will change all previous rules.¹⁰⁷ Since he wrote the article, other writers have developed the idea that government organizations can and should innovate and lead technological developments. For example, the economist Mariana Mazzucato in *The Entrepreneurial State* tackles ‘the myth of a lumbering, bureaucratic state versus a dynamic, innovative private sector’, using a range of case studies— such as IT, biotech, nanotech and green tech— to show ‘that the opposite is true: the private sector only finds the courage to invest after an entrepreneurial state has made the high-risk investments’¹⁰⁸.

Estonian experience: Estonia provides a fine illustration of this principle, summed up nicely by the current Estonian Prime Minister Taavi Rõivas:

‘We made a very conscious choice to build shared platforms, like joint digital identity and the whole-of-government data exchange layer X-Road, rather than allow diverse development. The idea was also to put in place the right conditions so that digital innovation can flourish in

¹⁰⁵ Interview, August 12, 2016.

¹⁰⁶ O’Reilly, 2010, p. 37.

¹⁰⁷ Ibid, p. 38.

¹⁰⁸ See Mariana Mazzucato (2015). *The entrepreneurial state: Debunking public vs. private sector myths*. Anthem Press.

all parts of the public sector and society—bottom-up. If some area falls behind, we try to lead by example and kick-start things top-down, too.’¹⁰⁹

This vision has been driven forward ever since then with sustained political will and strong leadership at the centre, backed up by legislative authority and strong, organizational drivers, as noted above. One interview suggested it started with the first Prime Minister, Mark Laar, who made it a strategy to lead from the centre: ‘if we want the rest of the public sector to use technology, we have to “walk the walk”’, as when putting all cabinet office business online. Since then, the President, the CIO, the Cabinet Office, and lead advisors in the Prime Minister’s Office continually push things forward. It helps that the political leadership have long been ‘tech friendly’, if not ‘tech savvy’ (there are no engineers or computer scientists in the Cabinet, although the current CIO is a former engineer and coder). The Information Systems Authority plays a clear role, as outlined above, to preserve the three layers of Estonian GaaP and the government has even attempted to mandate IT innovation within the state, with compulsory replacement of legacy systems¹¹⁰:

‘The experience of many countries shows that unless information systems are constantly redesigned, their administration costs will soar and the created “spaghetti architecture” will become impossible to untangle. To avoid getting stuck to old technology, a reform of public e-services and the supporting ICT solutions will be carried out. Estonian public services must be up-to-date with emerging technical possibilities and correspond to common quality requirements. Moreover, the so-called “no-legacy” principle will be introduced, i.e the public sector should not have any important ICT solutions that are older than 13 years¹¹¹’

In Estonia then, there does not seem to be the same sort of lag between government and the private sector as has been observed in other countries (Dunleavy et al, 2006). Innovation in the banking sector seems inextricably interlinked with government innovation, and started with the latter. It seems that there is pressure on the state to innovate from citizens – indeed, one interviewee suggested that there had been some public concern about the lack of new systems being developed recently, one factor behind the development of Sharemind.¹¹²

There is a wider sense in which Estonia embodies Mazzucato’s wider call for an entrepreneurial state. Estonia is now endeavouring to lead by example outside Estonia, across the world, in an initiative led by the e-Governance Academy. They have exported X-Road, or at least the services required to set up

¹⁰⁹ See Gary Anthes (2015), Estonia: A Model for e-Government. In: *Communications of the ACM*, 58(6), pp. 18-20. [online] Available at: <http://cacm.acm.org/magazines/2015/6/187320-estonia/abstract#> [Accessed 30.08.2016].

¹¹⁰ Laura Secorun Palet (2014). Taavi Kotka Is Putting the 'E' in Estonia. In: OZY.com [online] Available at <http://www.ozy.com/rising-stars/taavi-kotka-is-putting-the-e-in-estonia/32101> [Accessed 01.10.2016].

¹¹¹ Vanker, 2015, p. 8.

¹¹² Interview, August 30, 2016

X-Road to a number of countries including Finland, Denmark, Palestine and Azerbaijan. Here X-Road is not simply replicated in these countries, but exists as a kind of “middleware” layer between existing legacy systems and the front-end.¹¹³ The way in which the system was sold to Finland was particularly persuasive: the Finnish government initially wanted to embark on a small six month project to take the eHealth service, ePrescriptions, which would involve various health organizations talking to each other. But they were gradually persuaded that only X-Road would give them the functionality they needed. Larger countries such as Canada are now considering X-Road seriously. Interviewees responded wearily to questions such as ‘is it scalable?’ and ‘is it possible to implement X-Road in a big country: ‘of course it is’!

In summary, therefore, Estonia embodies some of the GaaP principles while others seem to have been unimportant. Openness was crucial, but a particular vision of openness based on security of individual data and open APIs, rather than ‘bolt on’ open data sets. Keeping it simple was also key, particularly in terms of clearing the legislative path and using central leadership and authority to work against departmental empires and to ensure a ‘data efficient’ model, where data are stored only once. Designing for participation was also evident with a mix of carrots and sticks – here the collaboration of banks and telephone companies was crucial, in terms of domesticating eServices in citizens everyday lives through internet banking and other private services, and thereby creating a base for interactions with the public sector. Finally, the principle of leading by example is also evident in the Estonian vision, with innovations like eResidency being used to shape Estonia’s place in the world (punching far above its weight in terms of size) and X-Road being exported across the world. In this way, Estonia seems to provide a test case for Mazzucato’s entrepreneurial state, albeit on a small and distinctive scale. The other principles seem to have been less important, with some of Estonia’s GaaP features actually working against ‘Implicit participation through data mining’, and ‘Experimentation’ or a ‘hacker culture’, given the emphasis on security, top-down design and central leadership of departments and agencies.

113 Kalev Aasmae (2015). X-Road middleware: Turning point for secure data transfer between nations?. In: ZDNet [online] Available at <http://www.zdnet.com/article/x-road-middleware-turning-point-for-secure-data-transfer-between-nations/> [Accessed 01.10.2016]; e-Estonia.com (2014). How international IT harmony can start with just a bit of middleware. In: e-Estonia.com [online] Available at <https://e-estonia.com/international-harmony-can-start-just-bit-middleware/> [Accessed 01.10.2016].

GOVERNMENT AS A PLATFORM IN THE UK

The UK presents a polar opposite to Estonia across many dimensions. Digital government in the UK has been developing since the 1950s when the largest government departments (such as Social Security and the Post Office) developed large-scale mainframe systems for administrative processing. So by the 2000s when digital government initiatives became widespread, the UK government was reliant on a complex network of heavily siloed information systems. Given the push towards outsourcing in the UK government from the 1980s onwards, these systems were mostly maintained and developed by global computer services providers, through huge outsourcing relationships which shaped the development of UK digital government¹¹⁴ All this made for a complex digital legacy with which to enter the 21st century. By the mid-2000s, the UK had developed a global reputation for massive multi-year contracts (sometimes over a billion in contract value), failed IT projects; and outdated, over-priced and under-used digital services¹¹⁵. The early policy for ‘Government on the Web’¹¹⁶ was to ‘let 1,000 nettles bloom’ and the disaggregated disorganized appearance of the government’s digital presence reflected that policy for many years afterwards.

From 2010, UK digital government had an injection of resources, organizational drive and central support, driven through the austerity-drive need to ‘do more for less’ under the mantra of ‘Digital by Default’. The incoming coalition government created the Government Digital Service under the leadership of Mike Bracken as Chief Digital Officer. In many areas the creation of GDS has been hailed as a success story, claiming £1.7 billion of cost savings to 2015. Rather than negotiating with every department, the Treasury negotiated with GDS rather than 24 departments and they were involved in every hiring decision for senior digital staff, raising the quality and capacity of digital expertise. They tackled the overweening power of the systems integrators and computer services providers, giving smaller departments and agencies the confidence to tackle unreasonable contract conditions and undertake some projects themselves with the help of GDS. All these actions led to the ‘insourcing’ or re-governmentalization of some functions, building up capacity across the civil service, embracing the open source movement, and taking away some of the taint of failure from government IT projects. In 2015, DVLA tweeted ‘In 1993 DVLA outsourced its IT. In 2015 it

¹¹⁴ See Helen Margetts (1998). *Information technology in government: Britain and America*, Routledge; Dunleavy, P. and Margetts, H. (2006, 2008). *Digital Era Governance: IT Corporations, the State, and e-Government*. Oxford: Oxford University Press; Helen Margetts, Patrick Dunleavy (2013). The second wave of digital-era governance: a quasi-paradigm for government on the Web. [online] *Philosophical Transaction of The Royal Society*, 371:20120382, pp. 1-17. [online] Available at: <http://www.ditchley.co.uk/assets/media/Phil%20Trans%20R%20Soc%20A-2013-Margetts-.pdf> [Accessed 29.08.2016].

¹¹⁵ See Dunleavy, P. and Margetts, H. (2006, 2008). *Digital Era Governance: IT Corporations, the State, and e-Government*. Oxford: Oxford University Press.

¹¹⁶ See Patrick Dunleavy, et al. (1999). *Government on the Web*. London: The Stationary Office, UK National Audit Office report HC 87 Session 1999-2000. [online] Available at: www.nao.gov.uk/publications [Accessed 29.08.2016].

brought it back in-house. :)’ and GDS responded ‘Well done. Big, big win. Gives Govt confidence that legacy tech is a problem we can solve’. Mike Bracken wooed the world with his talk of ‘beautiful public services’, bringing concepts like quality, innovation and robustness back into government, akin to the progressive public administration of the post-war era. These successes have engendered a procession of overseas visitors coming to worship at the source and imitations across the world from Australia to the US, where the recently created United States Digital Service in the Executive Office of the President is a direct imitation of GDS.¹¹⁷ In 2013, the UK signed a memorandum of understanding with Estonia, representing ‘a commitment by the two countries to work together on developing public services that are digital by default’¹¹⁸ In 2016, accolades finally came the UK’s way, with the UK leading the UN rankings for digital government, just as Estonia was slipping down to a middling position.¹¹⁹

GDS under Mike Bracken championed the Government as a Platform approach, and in the 2015 spending review, GDS received a major vote of confidence in the form of £450 million, with GaaP mentioned explicitly.¹²⁰ UK-style GaaP has been very different from Estonia, however. There is no equivalent of X-Road; the largest departments operate their own databases with few links between them. There is no centralised eID system or ID card and the nearest the UK has to a unique personal identifier, the National Insurance number, is issued only when a citizen starts to work, rather than at birth as in Estonia. The building blocks of the UK GaaP approach are Verify, a federated identity system that does not require ID, Govpay for making payments to government, and Notify for government agencies to notify citizens of progress on services.¹²¹ The most obvious GaaP feature is an official government portal for interacting with services, www.gov.uk. The policy was one of radical centralization, to have all the content controlled from the centre and only the back-end services going through to departments, and it has caught international attention¹²². The simple clean design and

¹¹⁷ See Whitehouse.gov, (2016). *The United States Digital Service*. [online] Available at: <https://www.whitehouse.gov/participate/united-states-digital-service> [Accessed 16.08.2016]; Dan Craddock (2016). *Two days at GDS – an Australian perspective*. [Blog] Government Digital Service. Available at: <https://gds.blog.gov.uk/2016/07/19/guest-post-two-days-at-gds-an-australian-perspective/> [Accessed 16.08.2016].

¹¹⁸ <https://www.gov.uk/government/publications/memorandum-of-understanding-between-uk-and-estonia-on-digital-services>

¹¹⁹ See UN Department of Economic and Social Affairs (2016). *United Nations E-Government Survey 2016*. [online] Available at: <http://workspace.unpan.org/sites/Internet/Documents/UNPAN96407.pdf> [Accessed 29.08.2016].

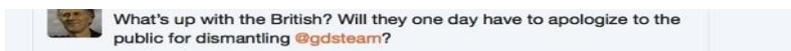
¹²⁰ See HM Treasury (2015). *Spending review and autumn statement 2015*. [Policy paper] Available at: <https://www.gov.uk/government/publications/spending-review-and-autumn-statement-2015-documents/spending-review-and-autumn-statement-2015> [Accessed 16.08.2016]; Sir Jeremy Heywood. (2015). *Digital in the Spending Review*. [Blog] Civil Service. Available at: <https://civilservice.blog.gov.uk/2015/12/08/digital-in-the-spending-review/> [Accessed 16.08.2016].

¹²¹ See Neil Merrett (2015). GDS aims to certify all GOV.UK Verify ID providers by January. [online] *Government Computing*. Available at: <http://central-government.governmentcomputing.com/news/gds-aims-to-certify-all-govuk-verify-id-providers-by-january-4667168> [Accessed 16.08.2016]; Peter Herlihy (2015). *Status tracking – making it easy to keep users informed*. [Blog] Government Digital Service. Available at: <https://gds.blog.gov.uk/2015/10/05/status-tracking-making-it-easy-to-keep-users-informed/> [Accessed 29.08.2016].

¹²² Interview, August 4, 2016.

open source model was a vast improvement on the proprietary and cumbersome portal (that could be changed only with lengthy change requests to the contract provider) that preceded it.

The weaknesses of this limited GaaP approach are visible. Although the Estonian model has been much admired in the UK and a system of data registries discussed as the best way to go since the earliest days of GDS¹²³, these have not got much past the discussion stage¹²⁴. GDS and the Department of Work and Pensions failed to work together on the first new system for Universal Credit, a major overhaul of the UK benefits system, and the huge Pathfinder contract with HP, Accenture, IBM and BT ran into serious trouble, with hundreds of millions of pounds written off (DWP are now building another new system in parallel, with GDS advice).¹²⁵ The Cabinet Minister who oversaw the heyday of GDS (Francis Maude) has admitted that if GDS had undertaken faster and more wholesale reform of legacy systems, it wouldn't be under threat now.¹²⁶ And by the autumn of 2016 GDS was in trouble. Mike Bracken departed in the autumn of 2015, amid rumours of lack of political support for the GaaP plan, although his departure was followed by the surprise award of £450 million in the autumn spending review. The new impetus provide by this injection of resources was halted again when in July 2016 his replacement Stephen Foreshaw also left, shortly followed in August by Janet Hughes, the Director of Verify, leaving the future of any system of identification unclear. There was discussion of a landgrab by the largest departments, and news that the digital leaders of the largest departments (tax, benefits and the Home Office), all hired by GDS, would be leaving their posts. Tim O'Reilly himself wrote a lament on LinkedIn, likening the possible demise of GDS to the UK government's treatment of the government computer scientist and codebreaker Alan Turing¹²⁷, tweeting:



So what of the principles of GaaP in the UK? First, with respect to **openness** – in contrast to earlier UK initiatives, www.gov.uk is written in open source and conforms to the same standards as the Estonian portal and X-Road The central portal was a massive improvement on previous efforts, where proprietary software and ill constructed outsourcing contracts meant any change to the government

¹²³ Interview, October 14, 2016

¹²⁴ Interview, September 9, 2016

¹²⁵ See Bryan Glick (2014). Universal Credit IT suppliers to be left out of new digital system development. [online] ComputerWeekly.com. Available at: <http://www.computerweekly.com/news/2240212027/Universal-Credit-IT-suppliers-to-be-frozen-out-of-new-digital-system-development> [Accessed 29.08.2016].

¹²⁶ See Rebecca Hill (2016). Improving Whitehall IT systems faster would have boosted morale, says Maude. *Public Technology*, [online]. Available at <https://www.publictechnology.net/articles/news/improving-whitehall-it-systems-faster-would-have-boosted-morale-says-maude> [Accessed 26.08.2016].

¹²⁷ See Tim O'Reilly (2016). What's Up With the British. The British have a way of turning their back on their greatest innovations. [online] LinkedIn. Available at: <https://www.linkedin.com/pulse/whats-up-british-tim-o-reilly?published=t> [Accessed 29.08.2016].

site involved lengthy specification and change requests¹²⁸. Likewise, the new ‘building blocks’ such as Notify and Verify are written in open source code. However, the vast majority of services – including the databases of HMRC, DWP and the Home Office, are developed in proprietary systems and often under large-scale complex contracts meaning their development is opaque. In contrast to Estonia, the emphasis in the UK has been on open datasets, with the creation of an open data portal data.gov.uk after a sustained push for the opening up of government data spearheaded by creator of the WWW Tim Berners Lee and his colleague Nigel Shadbolt under the Brown administration of 2009-2010. But there are few signs that open data is being used by either citizens or enterprises to make government more transparent or to improve government services¹²⁹. So the UK version of the openness principle is partial at best, and cannot really be seen as characterising UK digital government, as it does in Estonia.

Keep it **simple**? GDS have tried, particularly with the central portal which was based on ruthless centralization including of content, which meant that there was consistent look and feel across the whole of the government’s digital presence, while some editing processes were federated. Indeed some Estonian digital leaders have been visiting the UK to explore how this approach might be replicated in Estonia.¹³⁰ But the portal masks a messy and uncoordinated back end that nobody could call simple. The key issues are the complexity of the digital legacy, the continuing existence of large-scale contract relationships with systems integrators (in spite of GDS’s admirable efforts), and the lack of any equivalent to X-Road, or even a unique identifier for individuals. Indeed, identifiers are proliferating rather than consolidating, with the introduction of a new ‘unique learner number’¹³¹ for school pupils of aged 13 or above, to join the National Insurance Number, the NHS number, the Passport number and the Driving License ID, to name but a few. These arrangements work against the development of any registry system of the kind that underpins X-Road. GDS’s efforts to tackle this this infrastructure question looked threatened by developments at the time of writing, as O’Reilly noted in his response to comments on his blog post noted above:

‘GDS was working on with its new approach to platform engineering, modelled on the way that Amazon went from web application to internet platform. And it was this attempt to get

¹²⁸ See Patrick Dunleavy et al (2007). *Government on the Internet: Progress in delivering information and services online*. National Audit Office Report by the Comptroller and Auditor General, HC 529 Session 2006-2007, [online] Available at: http://www.governmentontheweb.org/sites/governmentontheweb.org/files/Government_On_The_Internet_Full-Report.pdf [Accessed 29.08.2016].

¹²⁹ See Amanda Clarke and Helen Margetts (2014). Governments and Citizens Getting to Know Each Other? Open, Closed, and Big Data in Public Management Reform. *Policy & Internet*, 6(4).

¹³⁰ Interview, August 12, 2016

¹³¹ See UCAS.com (2015). The Unique Learner Number (ULN). [online] The Universities and Colleges Admissions Service. Available at: <https://www.ucas.com/advisers/guides-and-resources/adviser-news/news/unique-learner-number-uln> [Accessed 29.08.2016].

into the bigger systems that need rethinking that got up the backs of the IT cartel. No one thinks that what the GDS accomplished to date was the end of the process! But the current initiative is not an attempt to take this vision forwards. It is to roll it back.¹³²

The closely related issue of **participation** is also challenged by the lack of infrastructure. GDS operates a transaction based approach, meaning that there were concerted efforts to drive up usage of some transactions (such as the renewal of road tax) but other services remained stubbornly non-digital (such as benefits applications) and others only partially so, such as voter registration where an application can be made on the government portal, but the rest of the transaction involves an email being sent from the portal to the voter's local council, who complete the transaction by post. This means that although some transactions reach high usage, there is little sense of an account management type relationship, such as one might have with a bank, although there are plans for such an initiative in the tax department, HMRC.¹³³

When it comes to implicit participation, through **data mining**, there is more discussion across the UK government than observed in Estonia above, led by the Government Office for Science, the 'Data Directorate' of GDS, the Office for National Statistics and other central bodies. Here the messy, disaggregated approach could have some advantages, as individual departments with large data resources may be free to innovate. Such a vision could provide new sources of large-scale administrative data that could be analysed and fed back into the design of government services and policy-making, something a growing data science community of interest in government is keen to explore. A data Summit in Oxford convened by the Oxford Internet Institute and the Alan Turing Institute for Data Science¹³⁴ early in 2016 convening policy-makers from across the government illustrated the strong interest in what data science might offer for government and policy-making. Initiatives remain challenged by the lack of an ethical framework and huge legislative, organizational and technical (given the lack of linkages between systems) uncertainties over data sharing. But in principle, the UK government does have opportunities to innovate with data science.

As far as learning from **hackers**, the early days of GDS involved quite a lot of 'hackathons'¹³⁵, where government officials, designers and developers came together to work on specific service delivery

¹³² O'Reilly, 2016.

¹³³ See Lis Evenstad (2016). HMRC shares details of IT transformation plans. [online] ComputerWeekly.com. Available at: <http://www.computerweekly.com/news/4500273209/HMRC-shares-details-of-IT-transformation-plans> [Accessed 29.08.2016].

¹³⁴ <http://blogs.oii.ox.ac.uk/policy/alan-turing-institute-and-oii-summit-on-data-science-for-government-and-policy-making/>.

¹³⁵ <https://designnotes.blog.gov.uk/2014/08/04/why-governments-need-hack-days/>.

problems and even more generalised ‘hack the state’ initiatives (run jointly by GDS and a social enterprise organisation Rewired State), to see what new things might be done with government data. Even as recently as February 2016, the Cabinet Office invited 30 developers to a ‘hack day to test Government as a Platform’¹³⁶, to test out the ‘building blocks’ such as Notify and Verify. But inevitably, these initiatives are based on open data, without really touching the huge databases of personal data and complex legacies of the largest departments. They are an interesting illustration of what this principle might lead to, in terms of actual playing around, experimentation and innovation with a government platform. But they have not yet penetrated any core government services, or led beyond small-scale initiatives.

With regard to **experimentation**, UK government has led the world in this area, with the Behavioural Insights Team established in No. 10 Downing Street by the coalition government in 2010, rolling out randomized control trials across departments and even abroad, with a Memorandum of Understanding with Singapore, for example. Most of the early experiments were predominantly offline, but the methodological approach would lend itself well to the digital, and if there could be sufficient joint working between the Behavioural Insights Team and GDS, it could lead to exciting developments in this area. Indeed experimentation is seen as an important element of the growing field of social data science, offering the possibility of causal inference that big data analytics cannot, so these two principles could be mutually reinforcing.

Can the UK **lead by example** then, now that it is a leader in the UN rankings? As discussed above, the UK has been much visited as a site of excellence in digital initiatives and even copied, for example by the US and their digital taskforce. Even Estonia is looking to replicate some elements of gov.uk in the development of their central portal. But as GDS enters a period of retraction and clear challenges to central support, we see little chance of the development of the other ‘layers’ of GaaP that have brought Estonia success, given the lack of any central authority to push governmentwide initiatives or shared services across the big departments. There may be pushes towards a platform approach within individual departments or sectors, particularly the massive tax department HMRC which is pushing towards a converged business model with a series of platforms, including a tax administration platform, which aims to give all small businesses and individuals access to digital tax accounts by 2016-2017.¹³⁷ Likewise there are initiatives for every school, college and university pupil to have a Personal Learner Record linked to the new learner number noted above, which is much

¹³⁶ <https://gds.blog.gov.uk/2016/02/05/a-hack-day-to-test-government-as-a-platform/>.
¹³⁷ Evenstad, 2016.

touted as a move towards a data driven approach to education. These plans, as yet impossible to evaluate, are proceeding within departments without central intervention.

CONCLUSION: LESSONS TO BE LEARNED

Ironically, the country that has explicitly aimed to implement the GaaP model seems to be far further from achieving it than Estonia, where some kind of platform vision seems to have materialised, although not explicitly articulated along the way. Returning to O'Reilly's original vision – 'A platform provider builds essential infrastructure, creates core applications that demonstrate the power of the platform and inspire outside developers to push the platform even further, and enforces "rules of the road" that ensure that applications work well together' – it feels that Estonia has achieved this part of the vision. The other part– the open platform that 'allows people inside and outside government to innovate' and that 'evolves through interactions between government and its citizens?'¹³⁸ is less evident. In this last section we explore what lessons might emerge from this analysis for Estonia, for the UK, and for the GaaP model itself.

1. Lessons for Estonia

The application of the GaaP model to Estonia, has revealed the importance of some principles - openness, simplicity, participation, and leading by example – which seem to be what has brought this tiny country closer than any other in the world to achieving the GaaP vision. Clearly however the Estonian model is developed in the future, these principles should be maintained and fostered.

With the other principles - data mining, learning from hackers, and experimentation – we find far less evidence of either their practice, or their importance to the development of Estonian digital government. The emphasis on central control and co-ordination, while crucial to the GaaP layers and the success of X-Road in particular, to some extent works against the 'hacker culture', and also towards the potential for experimentation and 'nudge' type behavioural interventions that platforms afford, which are viewed as low priority. Likewise, there are organizational barriers to data mining. As one official put it, 'it is about rational analysis, planning a system to solve the problem and then doing it',¹³⁹ and there seems tension between this approach and these more informal or exploratory principles. It may be, however, that these three principles offer some signposts for how the Estonian government move forward their vision and keep innovating. It may be that the Estonia can – and

¹³⁸ O'Reilly, 2010, p. 15.

¹³⁹ Interview, 30th August 2016.

should – relax a bit, resting on the laurels of X-Road and the other GaaP layers, in terms of prioritising some of these more playful and inventive aspects of the GaaP model. So developing some kind of platform for eService innovation, including developing the idea of replicated ‘data vaults’ mentioned by one of our interviewees, rolling out Sharemind across departments, or sharing the successes of the most successful departments such as the Tax and Customs Board, that all departments and agencies could use, could be the way forward for the future. Estonian officials have already visited GDS to investigate the building blocks developed there – Notify, GovPay, and the content management system for the portal www.gov.uk – and it could be that some kind of platform for service innovation could be a next step. Such an initiative might help to develop a more playful but ‘safety first’ form of data science, where experiments are regarded not as a frivolous and potentially expensive extra but as something that could be built in to service design and bring further efficiencies.

2. Lessons for the UK

Interestingly, the principles that have proved so durable in Estonia are those that the UK finds so elusive. The vision of openness has been pursued very differently in the UK, and perhaps the secret to the lack of success is the failure to recognise the tension between openness and security. In Estonia, as we have discussed these go hand in hand – while open standards and open source code are considered important, data must be secure and open only to the citizen to whom it pertains. In contrast, in the UK, some kinds of data are open, and some are closed, but the impossibility of opening up ‘closed data’ to the citizen to whom it relates seems to be regarded as an unattainable dream. One problem is perhaps the strong linkage in the public eye between any kind of eID or unique personal identifier with security – which causes concern over the potential for a big brother state, particularly after the Snowden revelations that the security and intelligence agencies are collecting vast quantities of data anyway. If it were possible rather to stress the importance of information exchange via data registries and a unique personal identifier with being able to access one’s own data – and to see who has accessed it – and to provide access to better services – it might inculcate a completely different attitude. But this is only likely to evolve within individual sectors – such as education, or tax – particularly given the UK government’s habit of endlessly inventing new identifiers, possibly in recognition of the sorry state of the back-end legacy information systems.

Simplicity is another seemingly unachievable principle. Several Estonian interviewees were of the opinion that ‘the problem with the UK is that it is too rich – and that is why it develops such

expensive and complex systems’, and that the UK should be taking advantage of the recent financial crisis (recognising that necessity is the mother of innovation) – and possibly the one to come post-Brexit – to put some simple GaaP layers in place. The last financial crisis brought GDS and ‘Digital by Default’ – the next one might be used for a renewed push towards the concept, as Estonia did back in the early days, recognising that the UK – just as Estonia then – does not have the resources to have a complex or inefficient solution. But at the time of writing, when central co-ordination and control is being pushed back, it seems unlikely that this is what will happen in the UK, even as we observe how important such mechanisms were in Estonia. More likely is the emergence of pockets of digital innovation and ‘leading by example’, for example in HMRC, DVLA or smaller agencies.¹⁴⁰ In these sectoral areas, there might be a chance to implement some GaaP principles and even to look to implementing X-Road within the largest departments, as more than one interviewee suggested¹⁴¹.

3. Lessons for the GaaP Model

So are there any lessons here for the GaaP model? If Estonia has realised this vision at least in part, does it tell us anything about what was missing from O’Reilly’s principles, or does it illustrate tensions between them that are not acknowledged in its original articulation? Certainly the issue of central leadership, co-ordination and authority seems to be underplayed, perhaps understandably because there is a sense that the GaaP model is about starting afresh – whereas governments are always starting from somewhere. O’Reilly’s lament over the GDS demise and the pull back from the Amazon type platform approach perhaps masks a failure to recognise that implementation of the GaaP approach means moving forward fast and ruthlessly backed up from the centre, as was the case in Estonia. For six years GDS luxuriated in the political support of their Minister Francis Maude, but even he has now acknowledged that if GDS had gone faster, they might have been able to prove themselves indispensable to departments. It seems in the UK context, it is somehow impossible to drive something like this across the government. Some commentators have suggested that we will see instead pockets of excellence emerging across government, in tax and DVLA, for example, and adopting some GaaP principles at the departmental level may be the best (and only) place to start.

The other thing that is missing is the tension between the principles, in particular between participation and openness. Crucial to participation is security – and that is true of both the private sector involvement, notably the banks, and individual citizens who want to know that their data is

¹⁴⁰ Interview, October 14, 2016

¹⁴¹ Interviews, August 12 and 30, 2016.

secure and that they have control over it. That means that personal data is not open to anyone to whom it does not pertain. By recognising this tension and prioritising those elements of openness that do not involve opening up data, Estonia have maximised participation in a way that has never been managed in the UK, which follows O-Reilly in not recognising this tension. A similar tension which we have discussed above for Estonia is the tension between data mining and participation – the participation rests on this strictly controlled view of data access – and that works against data analytics and data science methodologies – supposedly one of the keys to innovation and development that the platform approach affords.

There is no doubt that there is a lot that is coherent and useful about the GaaP approach. You have to start somewhere – and it feels like Estonia started in the right place, taking the principles that made sense at the time, ignoring the others for the present and pushing forward with the model, although never explicitly recognising it as such. That is what has enabled Estonia to lead by example, seemingly breaking down preconceptions about the inability of states to innovate, and makes it such an interesting and worthwhile example to show the possibilities for developing the GaaP approach in the future.

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Appendix A: Overview of eGovernment strategies and policies:*Estonian Information Society Strategy 2014-2020*

This document focuses primarily on ICT use and smart solutions in order to create an “enabling environment”.¹⁴² Above all, the Information Society Strategy 2014-2020 contains a number of steps of how ICT can support the competitiveness of the economy, public welfare and efficiency of the administration.

Cyber Security Strategy 2014-2017

This document outlines the basic cyber security strategy of Estonia. The strategy describes recent technological developments, cyber threats, and measures of how to mitigate cyber attacks.

Estonian Information Society Strategy 2013 (2008-2013)

This strategy was approved in 2006 and came into force in 2007. It sets out a general framework for a “sectoral development plan” which defines objectives and potential applications of ICT in order to develop a knowledge-based society.

Estonian Cyber Security Strategy 2012

This strategy was developed in 2008 and provides a national cyber security action plan up to 2013. It acts as a precursor to the Cyber Security Strategy 2014-2017.

Estonian Broadband Strategy 2011

This Broadband Strategy elaborates the developments and regulations through which the Estonian government aspires to reduce the digital divide between urban and rural areas.

Estonian Information Society 2004-2006

This document contains details about the initial ICT principles which the Estonian Parliament has approved in 1998. The principles provide a guide to policy decisions and act as a basis for the information society.

Implementation Plan (2009-2011)

This document provides an overview over the main activities which include strengthening the capabilities of the ICT sector, education and training of the labour force and the social responsibility of ICT companies amongst others.

Information Security Policy (2009-2011)

This policy specifies initiatives which are related to cyber security aiming to create a secure electronic

142 See eGovernment in Estonia, p. 17.

environment for citizens and the private sector.

Information society Strategy for Local Governments (2008-2011)

This strategy elaborates a development plan of how to introduce the electronic public administration across all government levels.

Programme for increasing awareness of the information society (2007-2013)

The programme aims to support the uptake of electronic services, the development of new services, and promote cyber security in order to ensure a sustainable progress of the information society.

Principles of the Estonian Information Policy (2004-2006)

The document outlines goals as well as long-term and short-term objectives for the Estonian information policy which revolve around the notion of developing electronic services and increasing the efficiency of the public sector.

Principles of the Estonian Information Policy (1998-2003)

This document was the first strategic move to define the guiding principles of the Estonian information policy and serve as an action plan for government agencies of how they intend to implement these principles.

Appendix B: List of the interviewees:

Hannes Astok	Head of Local e-Government Domain	hannes.astok@ega.ee
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Katrin Nyman-Metcalf	eGA Head of Research, Legal expert on e-governance	katrin.nyman-metcalf@ega.ee
Mari Pedak	eGA Senior Expert in Digital Identity, Head of Migration Service	mari.pedak@ega.ee
Siim Sikkut	Adviser, Strategy Unit, Government Office of Estonia	siim.sikkut@riigikantselei.ee
Jaan Priisalu	Former Director General of the Estonian Information System's Authority	jaan.priisalu@ttu.ee
Taavi Kotka	Chief Information Officer, Estonian Government	
Baldur Kobo	Cybernetica, X-Road expert	
Ashley Stephens	Government as a Platform Chief, Government Digital Service	
Mike Bracken	Chief Digital Officer (2010-2015)	
Janet Hughes	Director, Verify, GDS (-2016)	
Tom Steinberg	Founder and Director My Society (-2015); Digital	

	Transformation Lead at Big Lottery Fund (2016-)	
Jess McEvoy	Programme Director, Verify, GDS (2016-)	
Liam Maxwell	Chief Technology Officer (2010-2016); National Technology Advisor (2016-)_	