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Agile local governments: Experimentation before implementation

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A B S T R A C T

This paper discusses how local governments can team up for joint service provision, be more adaptive towards new technological and organisational changes and introduce novel services following main industry trends (e.g. predictive analytics, autonomous vehicles and artificial intelligence). The conceptual approach is to use Public Value (PV) as the framework for the organisation and management of government performance, one of the most important successor ‘paradigmettes’ of the New Public Management (NPM). Based on the PV concept, the ‘adaptive model’ for local governments is introduced according to which each procured ICT solution is preceded by agile, open, bottom-up and experimental trial. This model is corroborated via recent empirical evidence from the case of Helsinki and Tallinn which was obtained by observing how city governments collaborate on joint innovation-lab-type structures and conduct agile trials in the field of smart mobility before traditional procurement.

1. Introduction

This project is interested in how ICT adds public value via agile methods. According to the modern-classic essay by Dunleavy, Margetts, Bastow, and Tinkler (2008), government information systems are a big business (costing up to 1% of GDP a year), for instance, the United Kingdom spends around £ 14 billion annually to public-sector IT operations. At the same time, not all government IT projects deliver public value (Luna-Reyes, Picazo-Vela, Luna, & Gil-Garcia, 2016). In this light, there is a logical need to analyse and propose digital government models, both theoretical ones and through best practices. These models are becoming more complex and they have to solve the challenges how (local) governments can become more experimental, adaptive and agile at the same time delivering public and social value through digital government projects.

In this paper, we argue that a Public Management concept that, after the fall of the New Public Management (NPM), is particularly suitable to frame this phenomenon is Public Value (PV), as it offers a high degree of freedom for innovative solutions and has great potential for establishing open ecosystems that are pronounced as important by the e-Government side itself (inspired by the classic essay on the death of NPM-long live digital-era Governance by Dunleavy, Margetts, Bastow, & Tinkler, 2006). Empirically, we will look at a novel process for introducing Intelligent Transport System solutions tested in two EU capitals, Helsinki and Tallinn. This process is unique as the typical one-city procurement is preceded by open, agile and cross-border trials with

state-of-art technologies introduced via setting up two-city pop-up innovation structures for twelve months prior the procurement. The early empirical evidence indicates that it is possible for local governments to launch their own ICT solutions by having a higher level of technology, cross-border solutions and cooperation. We will analyse organisational, structural, managerial and procedural changes required to sustain and replicate this.

In order to achieve adaptive governance as proposed by Janssen and Voort (2016), organisations need to be able to deal with the changes and introduce more decentralised and bottom-up decision-making structures via mobilising more talents and participants. The main purpose of a private firm is to generate profit, but this is already inherently different in the public sector (Drechsler, 2005), which is crucial when evaluating the impact of ICT use in the public sector. Hence the focus on PV, which according to Moore (1995), is a broader understanding of a return or benefit than private value, adapted to the public sector for strategic management purposes. In other words, the aim of private managers is to create private (often monetary) value, whereas the aim of public managers is to create public (social) value (Luna-Reyes et al., 2016).

An increasing number of e-Government researchers (Cordella & Bonina, 2012; Karunasena & Deng, 2010; Kearns, 2004; Yıldız & Saylam, 2013; Yu, 2008) therefore recommend using PV in e-Government analysis, similarly to Public Administration scholars (e.g. O’Flynn, 2007). Nevertheless, the question remains how to do so, as PV as a theory remains necessarily fuzzy, or critically put, vague (Benington &

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Moore, 2011). This paper will offer one approach how to operationalise PV in e-Government research by building on the PV framework for e-Government by Kearns (2004) and Karunasena and Deng (2010) and deconstructing PV into high-quality services, achievement of outcomes and trust in public institutions. It does so by analyzing the cross-border setting of two European capitals (Helsinki and Tallinn) in depth by closely observing the agile approach for procuring ICT solutions for cross-border commuters. The sources of data for the qualitative case study include policy documents, project materials and interviews.

2. Literature review

Electronic government (or e-Government) is still a relatively novel concept. The term was widely unknown two decades ago but now is booming as there are academic programs on e-Government, specific conferences and journals solely devoted to this (Heeks & Bailur, 2007). On the other hand, the nature of e-Government is not static. According to Schelin (2003), before the introduction of the Internet and diffusion of personal computers, the main objectives of technology in government were improving the effectiveness of public administrators while increasing government productivity, e.g. the automation of mass transactions such as financial transactions using mainframe computers. After the Internet era, ICT is increasingly related to the way citizens and businesses interact with the government (non-tool view of technology). The next layer is an ICT-triggered change in the government on four layers: organisational, structural, managerial and procedural, as proposed by Gong and Janssen (2012). In parallel, agile methods, here defined as fast and responsive processes (Martini & Bosch, 2016), are introduced both for software development (e.g. Mergel, 2016) and for Open Government Data (e.g. McBride, Aavik, Kalvet, & Krimmer, 2018).

Nonetheless, most e-Government researchers agree that the concept of e-Government is vague as well (e.g., Aldrich, Bertot, & McClure, 2002; Bretschneider, 2003; Yildiz, 2007). There is no single, widely agreed upon definition (Halchin, 2004). In the current paper, e-Government is defined as “the use of ICTs, and particularly the Internet, as a tool to achieve better government” (OECD, 2003). The impact of e-Government at the broadest level is simply better government by enabling better policy outcomes, higher quality services, greater engagement with citizens and by improving other key outputs identified (Field, Muller, & Lau, 2003). A related concept is e-Governance which refers to the whole system involved in managing a society, including beside government institutions, also companies and voluntary organisations and citizens (Grönlund & Horan, 2005).

Similarly, digital government can be defined as the use of IT applications in government (Luna-Reyes et al., 2016). Yet by and large, and seeing how the word is actually used, it is just a newer, more fashionable synonym for e-Government. Adaptive governance originally stems from socio-ecological systems that can respond to rapid changes in the environment (Wang, Medaglia, & Zheng, 2017). With no agreed-upon definition, there seems to be consensus regarding the main characteristics of adaptive governance, introduced by Janssen and van der Voort (2016): decentralised decision-making, mobilisation of capabilities (internal/external), wider participation and adjustments to deal with uncertainty. Wang et al. (2017) introduced three types of adaptive governance: polycentric, agile and organic, in other words, claiming that agile governance is a part of adaptive governance. In the ICT domain, agile software development aims to make development processes fast and responsive, minimising the time between identification of a customer need and delivering a solution (Martini & Bosch, 2016).

The concepts of digital government, adaptive governance and agile governance are usually (if often implicitly) interlinked but not the same (see Fig. 1). This paper assumes that digital governance is the broadest concept while agile government the most narrow, although this is debatable. Zhang and Kim (2016) point out that digital government's

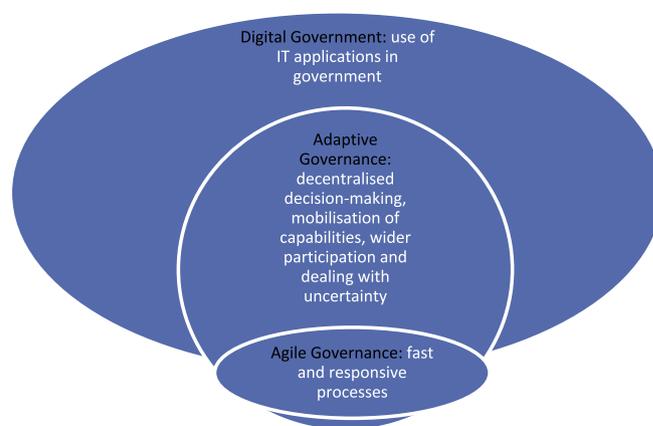


Fig. 1. Main concepts: digital government, adaptive and agile governance.

causal relationships are troubled by uncertainty. In reality, wicked problems also stand for adaptive and agile governance and largely influence their relationships. In other words, Fig. 1 is not static but dynamic and can be redrawn numerous times, with different scales and from different standpoints.

It has become commonplace to argue, according to authors such as Janowski, Pardo, and Davies (2012), that governments can no longer achieve public goals by themselves alone, but that they have to work through networks of state and non-state. Arguably, this was never different, and already Max Weber regards this as a truism (Kattel, Drechsler & Karo, 2018), the argument has currently entered the front of the state once again, and it is true that ICTs help to connect actors to the network and to build, manage and sustain relationships between them (Janowski et al., 2012).

One often associates the concept of “traditional” administration with Max Weber (although now, functionally it is NPM that is traditional). But the genesis of today's Public Administration is perhaps best described by Pollitt and Bouckaert (2017), as the result of a process like geological sedimentation, where new layers overlie but do not wash away the previous one. They describe a long list of different models and approaches to public sector management, including for our post-NPM time such ‘paradigmtes’ as joined-up government/whole of government, the Neo-Weberian State, and not least, the PV.

The question is how all this fits into the understanding of e-Government. In the literature, it has been often linked to the NPM, as claimed by many e-Government scholars (Alford & Hughes, 2008; Allen, Juillet, Paquet, & Roy, 2001; Cordella, 2007; Cordella & Bonina, 2012; Heeks, 2002; Yildiz & Saylam, 2013). The classic piece by Dunleavy, Patrick; Margetts, Helen; Bastow, Simon; Tinkler (2006) was instrumental in debunking this myth, however, and since then, an increasing number of scholars (Alford & Hughes, 2008; Cordella & Bonina, 2012; Yildiz & Saylam, 2013) argue for using specifically PV instead.

NPM is often presented as a “one-size fits all” view of the world (Alford & Hughes, 2008; Hood, 1991) that should not be suggested for local governments (Matheus & Janssen, 2017). Alford and Hughes (2008) propose that the next movement in public management should be “Public Value Pragmatism,” which is principle-bound regarding ends but pragmatic in means, in contrast to NPM which is seen as universal. Cordella and Bonina (2012) introduce PV as a paradigm shift from NPM to address ICT-enabled public sector reforms. According to them, this would change the weight of analysis of ICT implementation in the public sector from merely direct economic and management relationships in the direction to collective preferences (see also Table 1). In principle, PV can prioritise effective and efficient management practices but it may also focus on values of fairness, equality and just society.

Table 1
Public value versus new public management.

Paradigm	Public Value	New Public Management
Rationale	Public administration	Private management
Dominant focus	Relationships, politics enactment	Administrative rationalisation, results
Definition of public interest	Collective preferences	Aggregated individual preferences
Performance objective	Multiple objectives, shifting over time	Management of inputs and outputs to ensure economy and responsiveness to customers
Dominant model of accountability	Multiple accountability systems	Upward accountability via performance contracts
Preferred system of delivery	Menu of alternatives selected pragmatically	Private sector or tightly defined arms-length public agency
Means	Fulfilment of multiple objectives	Competition
Ends	Fulfilment of social expectations	“Government that works better and costs less”

Source: Cordella & Bonina, 2012 (adopted from O’Flynn (2007) & Stoker (2006)).

Once again, public sector and private sector management goals and aims are not strongly correlated, therefore, private sector management tools and practices should not be implemented without understanding the differences: private sector managers’ aim to generate private/monetary value whereas the public sector managers’ ultimate goal is improvement of the public/social value. This is the core reason why PV could be taken as the successor to NPM best-suited for e-Government, which has the same intentions and projections as well. In addition, also operations and applications are not the same between the two sectors (for example, Bertot, Estevez, & Janowski, 2016 split public and private sector applications and claim that policy and governance innovations are unique to the public sector exclusively).

Geographical and multilevel differences are not central to this analysis, although these dimensions matter. Hansson, Talantsev, Nouri, Ekenberg, and Lindgren (2016) have analysed the presence of open government deliberative ideology in post-soviet countries (including Estonia) and claim that post-soviet countries tend to focus more on freedom of information and accountability, and less on collaboration, diversity and innovation. There can also be the difference in adaptive governance on the local and central levels. Hong and Lee (2017), for example, claim that local governments are assumed to be more responsive to citizens, thus being more adaptive.

3. Research design and methods

3.1. Conceptual framework of PV for digital government

In this paper, we propose a way to organise and manage e-Government within the framework of PV. To use PV that way is not novel but has been done, e.g., by the World Economic Forum (World Economic Forum, 2011).

The main goal of PV, it has been claimed, is to examine the performance of public service from the perspective of citizens (Karunasena & Deng, 2010). The most common criticism towards PV is, as previously mentioned, that it suffers from definitional vagueness (Benington & Moore, 2011). Jorgensen and Bozeman (2007) identified 72 public values in 7 different value categories. To narrow this down, this project explicitly utilises the frameworks of Kearns (2004) and Karunasena and Deng (2010) to link e-Government with the concept of PV. This also matches, by and large, with definition of Good Governance by OECD, problematic though the latter may be (Drechsler, 2004).

Previous studies analysed for this project have claimed that there is an impact of e-Government on service quality (Kearns, 2004), mainly through an increased amount of information available to citizens, but questions areas such as take-up and fairness. There is mixed evidence on cost-reduction, but this might derive from time lag. In the case of desired social outcomes in important areas such as health, education or transportation, the results are inconsistent, although there is a positive story to tell in every aspect (Kearns, 2004). The relationship between e-Government and trust remains weak. Avgerou, Ganzaroli, Poullymenakou, and Reinhard (2009) claim that ICT can enforce

trustworthiness (the delivery what is expected), not trust, which is for them socially constructed.

Kearns (2004) proposes to link public value in relation to e-Government using three sources: 1) high quality of public services (availability, satisfaction of users, perceived importance, fairness of importance, fairness of provision, cost); 2) achievement of outcomes (improvements in health, reduced poverty, environmental improvements) and 3) trust in public institutions that also includes participation, inspired by Picazo-Vela, Gutiérrez-Martínez, Duhamel, Luna, and Luna-Reyes (2015) who propose citizen participation as an important factor of value creation. Karunasena and Deng (2010) suggest a framework for evaluating the public values of e-Government in Sri Lanka based on three drivers of public value creation: 1) delivery of quality services; 2) operating effective public organisations and 3) achievement of socially desirable outcomes. The conceptual framework for evaluating the PV of Government is proposed in Fig. 2.

3.2. Research design and method

This paper analyses the set-up of cross-border agile trials in Tallinn and Helsinki as part of the project FINEST Smart Mobility (FESM),¹ especially the design and implementation of open and agile innovation trials as part of the procurement process. This project was selected for the following reasons:

1. It meets the PV concept: open and collaborative approach
2. Real-life experimentation via agile trials
3. Cross-border set-up makes the model replicable in other cities
4. Focus on key PV aspects: aims to improve high-demand mobility services (quality of services) and reduce CO₂ emissions (achievement of social outcomes)
5. Access to recent primary and secondary data

The project summary is the following:

The connection between Helsinki West Harbour and Tallinn Old City Harbour is one of the busiest in the world with over 8 million annual passengers. The FESM project aims to tackle this ever-increasing challenge through intelligent traffic solutions. The project provides more fluent integration of different transport modes of this inter-city and cross-border traffic with piloting and planning ICT-driven solutions. As an outcome transportation time for both passengers and cargo are expected to be reduced. The better flow of people and good results in less CO₂ emission and noise in the port area as well as in the cities are expected. Through cross-border approach, end-to-end and user-centric experience are ensured and better cross-border mobility planning achieved. The project is funded through Interreg Central Baltic programme (EU Structural funds) with a total budget of 1.8 million euros. Project partners are City of Helsinki, City of Tallinn, IITL Digital Lab,

¹ www.finestsmartmobility.com



Fig. 2. The Public Value theoretical framework.

City of Vantaa, Estonian Road Administration and Forum Virium Helsinki.

The research method is a case study of Tallinn and greater Helsinki (cities of Helsinki and Vantaa) pursuing to implement digital urban transport solutions. Data was gathered through in-depth analysis of open-innovation living-lab trials via joint procurement between Tallinn and Helsinki. The data collection can be divided into two parts: 1. Preparatory phase and 2. Competition phase (see Fig. 3 below).

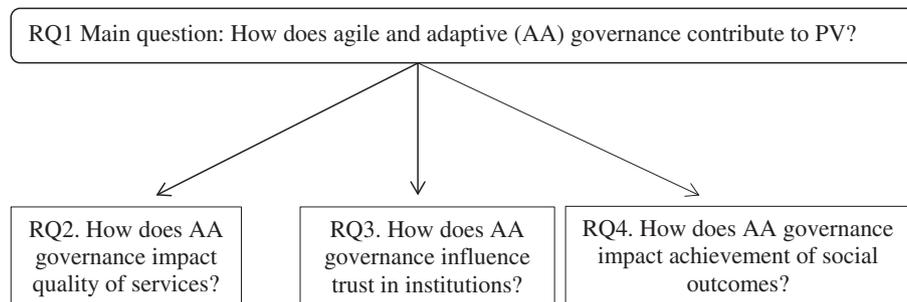
In the preparation phase (mid 2015–mid 2016), data was gathered via primary and secondary sources. The primary data include non-structured focus group interviews that were conducted with the city representatives (three officials from the city of Tallinn, three from the city of Helsinki and one official from the Ministry of Economic Affairs and Communications, Estonia) and companies (five Intelligent Transport Systems companies). In addition, the Estonian Association of Information Technology and Telecommunications also participated in both focus group interviews. Secondary sources include published and unpublished reports, project proposals and documents.

The competition phase includes a punctual description of the two-city procurement process. We observed the design and implementation of the agile piloting phase via access to procurement documents and companies' bids and participated the evaluation meetings. The most important evaluation consensus meeting took place on 19 December 2016 and had nine participants (four from the city of Helsinki, two from the city of Vantaa, one from the city of Tallinn, one from Ministry of Economic Affairs and Communications and one from the Estonian Association of Information Technology and Telecommunications).

specific city-level procurements, the agile trials programme was open for everybody to participate. The prize fund was € 67,500 and participants were instructed to bid in the range of € 2000 – € 15,000. The call was introduced in October 2016 and disseminated through various channels (e.g. websites, direct contact with companies, advertisement in national workshops and seminars but also in international ones like Barcelona Smart City Expo). The application form published on the website² had simple and easy-fill-in structure and with no restrictions set for participants (e.g. size of a company, previous experiences, country of origin etc.). The applicants had to give their basic contacts and provide a brief answer to the following questions (see also Appendix 1):

- A brief description of the fast innovation trial: How would you use the money?
- Who would execute the trial in your organisation?
- Your proposed price of the trial (in EUR, including VAT)
- What are the tasks and deliverables, and their schedule
- How do you think your proposal would help plan better smart mobility solutions?
- What would you need from the consortium in order to execute the trial?
- Do you give the consortium right to use the deliverables in the project next stage planning and promotion?
- Public two-paragraph text presentation of your trial

The application process, a wide and open participation process with no restrictions, attracted much interest towards the agile trials programme. In total, there were 35 international applications submitted, from which five trials were selected (success rate of 14%). Most applicants were SMEs, although there were a few start-ups, two big local players with more than thousand employees and one global technology



3.2.1. Competition phase: agile pilots programme implementation and evaluation

The agile trials programme was set-up by two innovation labs, Forum Virium and ITL Digital Lab. Compared to the detailed and

² <http://www.finestlink.fi/smartmobility>

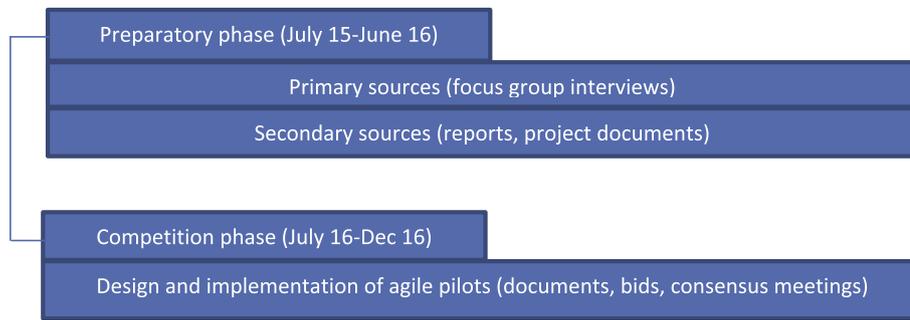


Fig. 3. Research design in two phases.

company. Typically, filling in the application form took half an hour to one day (feedback from winning proposals) which can be considered as low bureaucracy. As a selective process, the proposals introduced various state-of-art solutions like machine-learning, autonomous cars, robots in ports, artificial intelligence, 3D virtual models, smart city sensors and LoRa application.

The proposals were evaluated by nine experts from partner's organisations (Forum Virium, ITL Digital Lab, Road Administration and cities of Helsinki, Vantaa and Tallinn) as well as one associated partner (Ministry of Economic Affairs and Communications in Estonia). All participants had to evaluate each proposal following the four evaluation criteria, each ranked from 1 to 5 (see Table 2). After individual votes, there was a consensus meeting that analysed the first 20 proposals and generated the list of five winning proposals and five second-best proposals. The winners were announced late December 2016 and trials started in January 2017.

4. Analysis and results

4.1. Setting the scene: Tallinn-Helsinki cross-border area

Two European capitals, Helsinki and Tallinn, are in a unique situation. Between the two small nations (combined population of seven million), there is a high commuting frequency. According to the national statistics, approximately every 15–20th Estonian lives in Finland and commutes back to Estonia on a regular basis (see also Fig. 4 – based on the mobile positioning data). For Finland, Estonia is the most popular investment and tourism destination; every fifth Finn stays overnight in Estonia each year. The two countries speak unique Finno-Ugric languages. In terms of innovation, both countries are relatively strong in digital innovations.

On the national levels, Estonia and Finland have a reputation of being frontrunners of digital innovations. Two very small European countries are the birthplaces of Nokia and Skype, respectively. Estonia is renowned for having one of the most innovative e-Governments in Europe.³ No other nation has equipped each of its citizens with a secure digital identity and no other nation has connected all public databases over the Internet, using a secure transport layer (the X-road). Helsinki, on the other hand, is considered among the 6 most successful European smart cities.⁴

4.1.1. Digital infrastructure in the region

From the ICT architecture, there are two cornerstones of the ICT deployment in Estonia: widely used electronic identity and secure exchange of data over the Internet. In the first case, most residents of Estonia (93%) have a personal ID card that is used in the digital environment for authentication and electronic signatures (Soe, 2017).

³ [http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/507481/IPOL-MCO_ET\(2013\)507481_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/507481/IPOL-MCO_ET(2013)507481_EN.pdf)

⁴ [www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET\(2014\)507480_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf)

Secondly, all government-sector databases (over 3000) are linked with each other via the Internet using the secure transport platform called x-road (see Fig. 5). The x-road is an open-standard transport layer that connects various databases with each other, independent from the vendors (potential for full interoperability).

The public infrastructure applies to Finland and two capital cities as well. The Estonian ID card is taken over by Finland and Finland is the second country to implement the X-road. This offers an experimental setting for digital cross-border services.

4.2. The mobility challenge in the region

The ferry connection between Helsinki West Harbour and Tallinn Old City Harbour is one of the busiest in Europe with over eight million annual passengers. The North Sea-Baltic TEN-T Core corridor meets Scandinavian-Mediterranean TEN-T core corridor at Helsinki, thus being a key node in the transport networks of northern Europe. Already the current traffic creates substantial congestion, noise and other negative externalities at both ports and at both cities. There has been no common mobility planning and there are no cross-border Intelligent Transport System (ITS) solutions.

According to the Finnish Traffic Agency, there are over 8 million travellers (see Fig. 6), over a million private cars and 0.25 million trucks taking the mobility journey between Helsinki Harbours and Tallinn Old City Harbour annually. The total mobility has been growing and has been projected to grow. Both cities have decided to keep the ports next to the city centres and are building new residential areas immediately next to the port sites. In both ports, the amount of space reserved for truck parking is decreasing. Already with the current traffic level to/from ports, the congestion, as well as noise and other negative externalities, is substantial. This affects both the travellers as well as local residents. For example, the peak driving times for the first kilometre out from the port has been measured to be over 50 min.

The rush hours of loading and unloading the ferries and the interference of the port traffic with the daily commuting traffic create peak congestion events that escalate the problems. Better management of these interferences is possible with smart solutions, and with better mobility planning. More so, the mobility users see the ferry leg of their journey just as one part of their trip and the modality changes at both ports as a single entity. The cross-border approach is needed to ensure a smooth end-to-end user experience.

The lack of intelligent transport systems has been listed as one of the main missing links for the North-Sea Baltic corridor by the European Union.

4.3. FESM initiative objectives for providing public value

The Finest Smart Mobility project aims to provide more fluent integration of different transport modes of inter-city and cross-border traffic via the planning and piloting of ICT-driven solutions, in order to reduce time in transportation for both passengers and cargo, that is, to provide better public value. The better flow reduces both time vehicles

Table 2
Evaluation of agile trials.

Criteria for evaluation	Evaluated in scale 1–5
Innovativeness of the trial	<ul style="list-style-type: none"> ● A genuinely new service idea or product ● The experiment generated new practices/solutions/aspects to a specific challenge
Potential for a scalable service	<ul style="list-style-type: none"> ● Usability of the service ● The functionality of the business model ● The potential for long-term solution ● Can be put in practice in Helsinki and Tallinn capital regions early 2017
Teams and resources	<ul style="list-style-type: none"> ● Skills and know-how of the executive team ● Other resources of the executive team (e.g. funding, collaboration) ● Potential to continue developing the service after the experiment ● Executed by a consortium of more than one organisation or company
Smart, agile and user-driven	<ul style="list-style-type: none"> ● Service/product utilises ICT-technology or data ● Use of agile development methods ● Service responds to the needs of users

spend in port areas as well as the fluency of the traffic flow. This will also reduce CO₂ emissions and noise. The cross-border approach is needed in order ensure the end-to-end user-centric experience of the mobility as well as better planning: same or similar tools for the commuters on both ports, tools for the ferry operators, urban planners, and data.

The FESM project is piloting smart solutions that will reduce the travel time. The project contributes to these targets also indirectly: by contributing to open data and open source enablers for further innovations, and by mobility planning that further enables and drives

towards travel time reduction in the mobility. The FESM aims to create also market references for smart port solution provider companies.

The FESM project plans to create pragmatic improvements and enablers that directly enhance the mobility flows and have a direct impact on mobility planning for local governments. Smart mobility solutions - ICT-based solutions - are aimed to be a potential and cost-effective way to increase and improve the mobility flows. They are also potentially a tool to integrate services on both ports and cities in order to enhance the user experience, and use of sustainable options. The project aims to solve specific, highly visible mobility challenges with smart solution pilots.

The project plans to improve the mobility flows arriving and leaving the Helsinki West Harbour and Tallinn Old City Harbour. It will optimise and smoothen the mobility journeys of people, public transport, private cars and trucks arriving and leaving the ports. It addresses both local and transit traffic. It does this

- i) by implementing ICT solutions ('pilots') which improve the efficiency and enable smart management of mobility, and
- ii) by creating a mobility plan that addresses the international mobility aspects.

As the traffic is heavily congested at peak hours, coherent mobility management together with smart ICT solutions is planned to lead to a reduction of travel times, which contributes both to transport flows of people and transport flows of goods. More fluent mobility flow and faster travel times will also lead to fewer CO₂ emissions per person/per tonne, less noise and other emissions at residential areas next to the ports. Congestion escalates these negative externalities, for example, repeated stops and starts of the trucks create more emissions than fluent driving.

The smart solutions can substantially contribute to successful

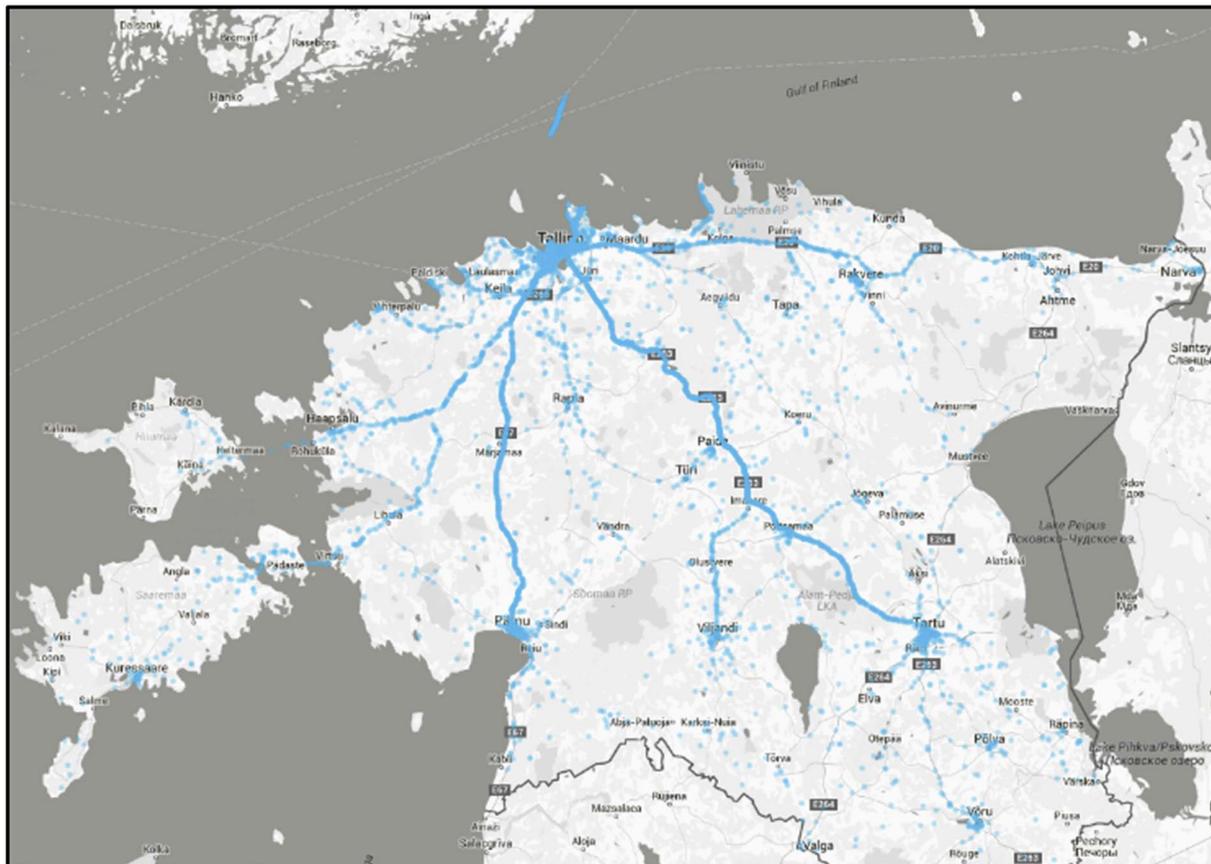


Fig. 4. Commuting frequency between Estonia and Finland.

Fig. 5. The X-road. Source: Information System Authority of Estonia

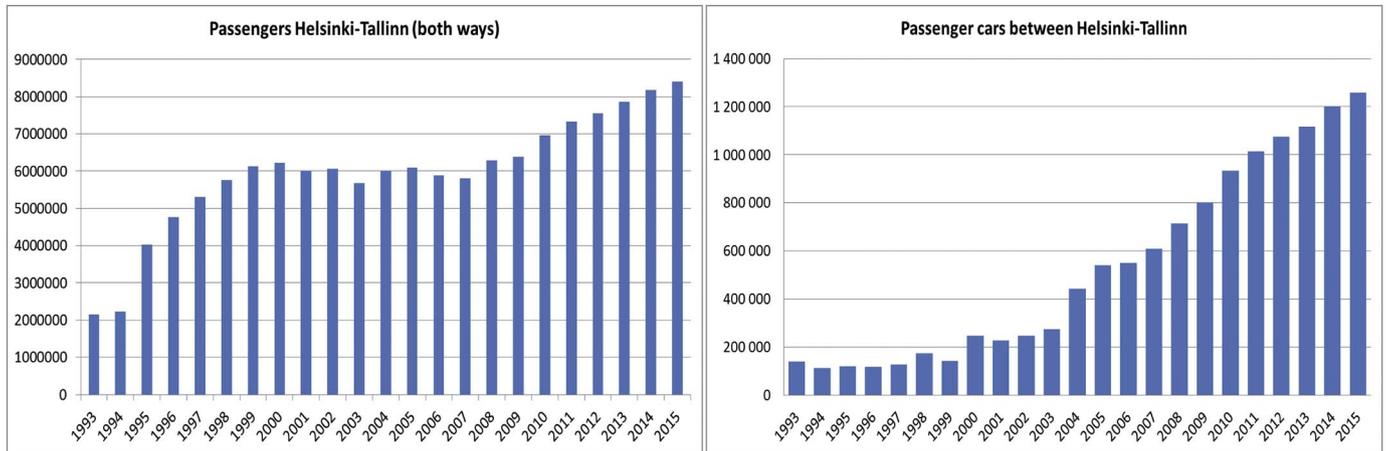
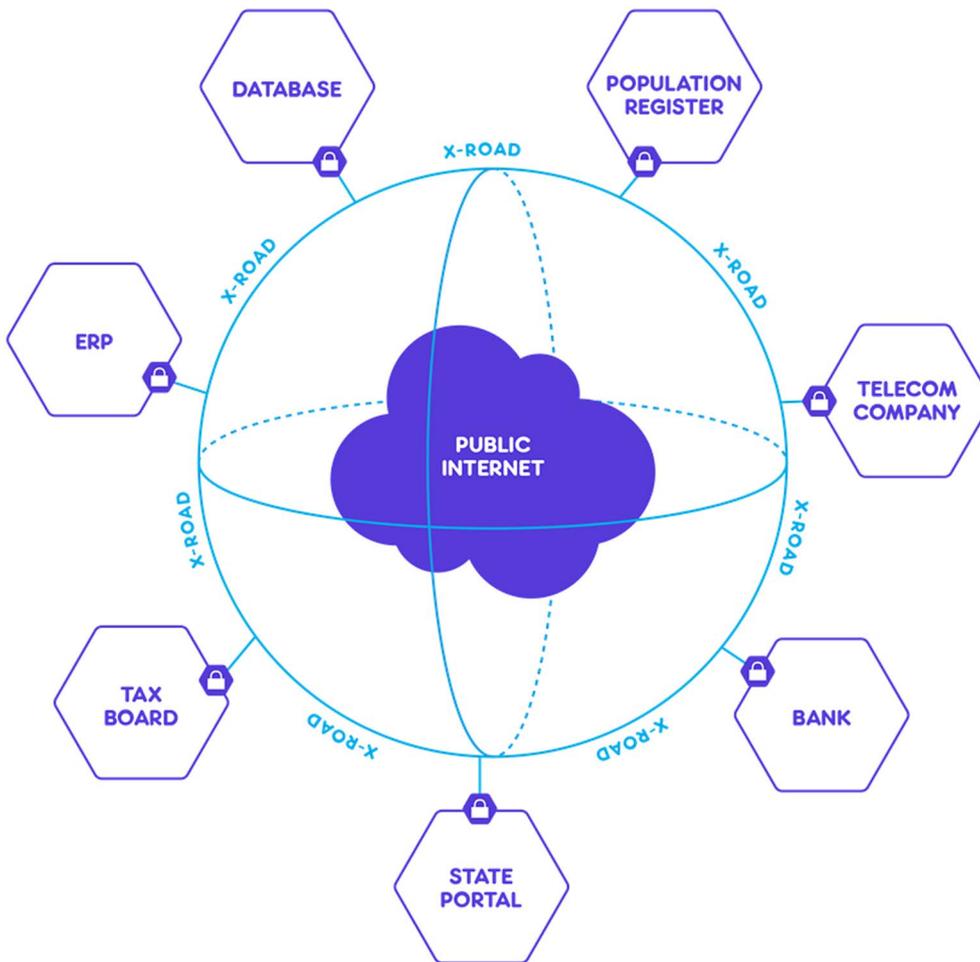


Fig. 6. Passengers between Tallinn-Helsinki. (Source: Finnish Traffic Agency, 2016)

management of the closure of the truck parking areas near the ports. From the users' perspective, the smart solutions can provide a smooth integration of the different modalities, and easy to use information about the public transport options. This could further drive the modal shift towards public transport, easing the congestion by choosing sustainable transport modes.

4.4. FESM piloting programme

The FESM project will conduct five pilots to be implemented in

2017–2019:

- **PILOT 1:** Just-in-time logistics for Heavy Good Vehicles, based on truck parking at the ring-roads and mobile application that directs them to the boarding. This is expected to reduce the time-in-city with an estimate of 5–10% per truck. This is also a key tool to manage the closure of the truck parking at ports.
- **PILOT 2:** Smart management outbound traffic, with dynamic mobility management with signage and integration to navigators and possibly to smart traffic lights. This integrates the unloading traffic

to city traffic better, improving also other traffic.

- **PILOT 3:** Smart Park&Ride for ferry passengers with private cars to increase the use of public transport for the port entry/exit. This includes easy real-time information and ordering of the Park&Ride and public transport options. This is expected to reduce the number of private cars to the ports by 5%.
- **PILOT 4:** Smart traffic solution pilot in order to increase the modal split of public transport for travellers from Estonia to Helsinki Airport with a ferry connection.
- **PILOT 5:** a feasibility study with a pilot regarding the Tallinn ring-road to improve the management of both commuting and international transit traffic flows with ITS solutions.

The focus of the project is to pilot and invest to new types of solutions to optimise the flow of people and goods. Solutions will be used and developed also after the project, and are projected to be replicable to other environments. For example, queuing systems for ports will be extended to ensure smoother and less congested traffic flow. As ports are currently developed and Heavy-Goods-Vehicles (HGV) waiting areas will be closed, it is clear that there is a need for a “smart” queuing system. The same applies for out-going traffic, which easily creates congestion in cities, with smart guiding systems the congestion can be avoided. In Vantaa, the objective is to integrate the cross-border public transport and ferry options, which will lead to increased use of public transport for various passenger groups. In Tallinn, at least one of the intersections on Reidi tee (the new road to the main port) will be equipped with self-learning adaptive streetlights; this improves vehicles’ permeability and reduces traffic congestion and also CO₂ emissions. The City of Tallinn has the intention for developing a “smart” intersection solution, using more real-time analysis in the main novel road to the Old Harbour, which could be extended later to other main intersections. It is certainly wise to continue developing of Smart Park & Ride (P&R) after the end of the project and currently, Tallinn is trying to find ways to expand the system even more (new P&R terminals, new smart services, etc.). The feasibility study of dynamic traffic management will be in a key role to plan and implement real ITS technology investments on ring road corridor which is connector road to main ports. Cross-border solutions developed during this project can be expanded to similar solutions to other EU countries.

4.5. Agile trials for cross-border regions

To ensure the pilots’ quality from the user perspective, and the best exploitation of emerging technologies, the project engages the planners, mobility users and technology stakeholders in the process of co-designing the use cases: descriptions of journeys on ‘how things could be’, including agile trials of emerging technologies (€ 67,500 in value). The project then executes the large pilots (€ 1,000,000 in value) through a public procurement. The take-up of smart solutions will affect the real-life mobility journeys and travel time. Smart solution pilots will primarily be integrated features into existing user interfaces e.g. car navigators, route planners and ferry applications. This is accomplished with open data and open APIs.

This FESM is unique for introducing open and agile trials before procuring the pilots that will be developed into long-lasting solutions (see Fig. 7). This set-up is experimental and if proven successful, could be a trigger for change how local governments procure novel ICT solutions. Conceptually, this is a shift towards bottom-up and decentralised local government that implements up-to-date technologies including a large group of stakeholders in the first stages. On the other hand, this also means higher initial investment. There are very few examples of local governments doing experimental trials before real ICT procurement. The next chapter will describe the trials in depth.

4.6. Organisation change: creating public value via innovation ecosystem

In order to develop the traffic flow between regions, it is vital to involve all parties. This project involves relevant organisations from Tallinn and Helsinki, and it creates a common understanding how seamless travel can be achieved. A substantial share of the traffic in the macro-region consists of cross-border traffic between Helsinki and Tallinn. The traffic planning regarding one city/port directly affects the other. To enable optimal mobility planning and optimal solutions, a common approach is needed. The core partnership structure is created naturally from the challenge addressed: public sector organisations responsible for the management and planning of take-up of smart solutions in the Tallinn Old City Harbour - Helsinki West Harbour connection. These are teamed-up with innovation labs and operate in a close collaboration with ports of Tallinn-Helsinki.

Core partners of the FESM:

- **City of Helsinki** (capital of Finland) is the local authority over mobility related issues in Helsinki. City of Helsinki (Economic Development division) coordinates the whole project. City of Helsinki (City Planning Department; West Harbour Project) will provide expertise for the harbour mobility planning for the pilots. **Responsible for pilots.**
- **The city of Vantaa** is the location of Helsinki Airport. **Responsible for pilots.**
- **City of Tallinn** (capital of Estonia) is the local authority over mobility related issues in Tallinn and consequently a partner in the project pilots. **Responsible for pilots.**
- **Estonian Road Administration** is a government agency which performs the implementation of state policy and development programmes, management functions, state supervision, and applies the enforcement powers of the state in the field of road management, traffic safety, public transport and the environmental safety of vehicles. **Responsible for pilots.**
- **The Estonian ITL Digital Lab** is a non-profit and non-governmental organisation dedicated to uniting companies in the ICT sector. **Responsible for agile trials.**
- **Forum Virium** is a limited company fully owned by the City of Helsinki. **Responsible for agile trials.**

All pilots start with a one-year planning stage done together by all partners. This consists of expertise planning with mobility experts and authorities, detailed market analysis, and user-centric solutions/requirements planning with the real mobility users (public transport operators, private car travellers, truck drivers, truck companies). Small agile trials to probe and validate new technology opportunities are part of the planning stage. After the planning stage, the pilots will be executed in the implementation stage in 2017–2018. Procurement with competitive dialogue procedure will be used as the tool to execute the pilots. The pilots will end with a transition period that will integrate the piloted solutions into cities’ normal operations. The preparation also includes identification and involvement of the key stakeholders and partners, defining the development process and scope of the plan.

In total, five agile trials and five pilots will be executed by external providers (companies). The specifications for pilots will be developed after conducting trials, that is, real hands-on demonstrations in real-life for approximately one week. There are clear elements of organisational, structural, managerial and procedural changes: trials are designed and conducted by innovation labs (Forum Virium and ITL Digital Lab) whereas the real pilots and solutions will be procured by ‘mature players’, the cities of Helsinki, Vantaa and Tallinn. The core reason for linking innovation labs to this process is to be adaptive and agile compared to the assumed established bureaucratic structures of cities (although this is a bit of a cliché, *Kattel, Drechsler & Karo, 2018*). The trials took four months from project kick-off to real implementation of these, see the Fig. 8.

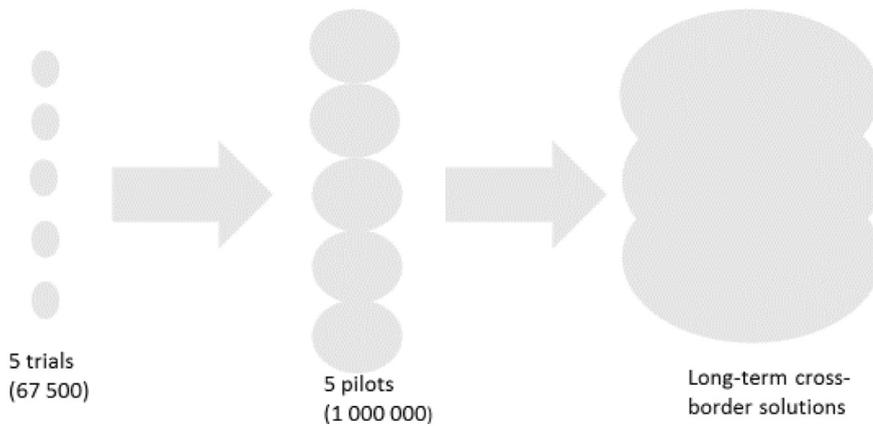


Fig. 7. Overview of the FESM project concept.

5. Results

This paper contributes to seeking the novel theoretical models how governments, especially local ones, can generate more public and social value with ICT projects. First, PV as a concept is proposed for evaluation in the (local) digital government research. Secondly, this paper contributes linking public value with emerging concepts of adaptive and agile governance. Thirdly, a modified conceptual framework is proposed (see also Table 3). Therefore, the main theoretical contribution is linking adaptive and agile governance with the PV concept. In addition, this paper argues that digitalisation is challenging the closed-unit conceptualisation of governments: there is a need for cross-border models as digital tools can effectively work across the borders.

Empirically, the aim of agile trials programme was to make a public and open call for prototypes in the field of planned five pilots. The specifications for the larger pilots will be adjusted according to the results of the trials. The initial pilots were designed by three cities and Road Administration officials two-three years ago which is a typical time lag from project planning to project implementation in the public sector. For city-administrations, agile trials are considered as a market test, to understand what kind of novel technologies are available. Therefore, trials introduce agile and adaptive feedback mechanism into the standard procurement process: through open and wide calls for trials, local governments can test the market and experiment with new solutions. After the trials are concluded, the specifications for real pilots and therefore also long-lasting ICT solutions can incorporate more state-of-the-art solutions.

There were five winning proposals financed by the innovation labs in the consortium. Two proposals were from Finland and three from Estonia. There is a clear pattern of success: the winning trials are the experimental ones with easy-to-implement real-life autonomous trials with limited or no integration of databases and systems of partners needed for trials. The following winning agile trials were implemented in 2017:

- **Goswift:** as the port traffic is growing and the amount of truck parking around the port is reduced, a smart service solution is required. City Port Arrival Management (CPAM) will provide heavy goods vehicles with a specific arrival route and time to start the journey. It will be an improvement for all stakeholders: truck drivers will know their reliable route to the port, ferry operators will know that the vehicles arrive on time and the city will have the possibility to limit congestion, noise and pollution.
- **Positium** will develop a service prototype whose purpose is to better understand cross-border movements in twin-cities using mobile phone location data. Movements of people travelling between Helsinki and Tallinn and their journeys in destinations are analysed and visualised. Ferry companies are able to identify passenger flows between harbours but have little information about further

movement after leaving the ferry. This service prototype will add a new dimension: Positium will analyse the mobility flows that pass through ports and map the movements in both urban areas after arriving in port (Estonians in Helsinki region and Finns in Tallinn regions). As a result, we will be able to map popular tourist stops, as well as the most common routes taken at the destination. Knowing tourists' activity spaces, better urban planning can be undertaken, creating a pleasant environment for both the tourists and the locals.

- **Jiffi** is the world's first hands-free mobile ticketing system for public transport that utilises Bluetooth Low Energy communication protocol and micro-location technology to detect when passengers enter and exit the transit vehicle. This will streamline ticketing process, thus speeding up the time of travel. Jiffi's system would be installed on the trams servicing West Terminal in Helsinki for a limited piloting period so that a selected group of passengers arriving from Tallinn would be able to test the system and give valuable feedback about the accuracy and pleasantness of the new innovative solution.
- **FLOU:** Successfully managed open ecosystems enable new and existing companies to act as Sherpas combining existing services to create better service levels for FinEst (Finland and Estonia) passengers as well as motivating them to reduce external costs of their transportation. The aim of the FinEst Sherpa challenge is to look at new service models, project the benefits to different stakeholders and find a way to enable the ecosystem.
- The **TownHall24** trial with a 24/7 accessible smart container and a digital service platform provides carless alternatives to local transport and logistics needs. Passengers and locals can rent equipment to complement their own or shared public transport options such as city bikes, share second-hand goods and receive deliveries to reduce shopping trips and errands or have heavy luggage delivered to the port by other drivers while taking public transport themselves.

6. Discussion and implications

The key point to understand a winning smart solution is to understand that this is not a one-city nor one-country game. Even megacities (Tokyo, Sao Paulo) are arguably challenged when having to create a real ecosystem of cutting-edge agile and adaptive governance solutions (predictive analytics, Internet of Things and Big Data technologies). The first instalments have led to inflexible “smart cities in a box” or “smart countries in a box,” which are ageing fast, and from which solutions do



Fig. 8. The timeline of agile trials.

Table 3
Main theoretical contribution.

Main contribution	Theoretical building blocks
1. Using Public value for digital government research	Benington and Moore; Cordella, Bonina and Willcocks; Luna-Reyes, Picazo-Vela, Luna & Gil-Garcia,
2. Establishing a link between public value and adaptive and agile governance	Bertot, Estevez, Janowski; Hong and Lee; Janssen and van der Voort; Mergel; Wang, Medaglia & Zheng
3. Public Value framework for digital government including adaptive and agile governance	Karunasena and Deng; Kearns

not scale elsewhere. This paper observed closely a case of cross-border cities (Helsinki, Tallinn and Vantaa) co-operation in the search for joint solutions for end-users as proofs that local governments can be agile and adaptive by implementing new methods (experimental trials) and working closely with innovation labs with different organisational culture than centuries-old traditional local governments.

6.1. Theoretical implications

Citizens in cross-border regions are interested in local governments' ability to provide public value through quality of services, real outcomes against societal challenges that combined creates trust in institutions – a conceptual framework suggested for e-Government research in this paper. What should the cities do if 1/15 of the population commutes to the neighbouring city in a different country? The NPM, rooted in protecting a single entity's financial interests, did not provide a solution for this, as the foundation of the NPM is that cities have to compete with each other, e.g. for the tax revenues. The PV concept is proposed as it is not focused on drawing strict borders between the cities but is focused on cooperation and openness instead. When comparing ICT solutions offered by local governments with successful technology companies, one key factor stands out: solutions offered by technology companies go over the borders, solutions offered by local governments typically end where the borders of that city end. For example, Uber works the same way in all cities unless banned but there are hundreds of interoperable smart transport cards introduced by local governments and locked-in to specific cities only.

6.2. Practical implications

There is limited evidence how local governments can be more adaptive to a changing environment and introduce agile methods, and this project provides practical advice for local governments on how to design and implement agile trials. This paper has observed a new model how local governments (and also central governments) can be more “innovative” by using agile tools in an open collaboration with neighbouring local governments, innovation labs and SMEs. This project monitored closely how local governments can introduce open and agile trials before ICT procurement and implementation. Typically, the

Table 4
Agile trials (PV) versus traditional approach (NPM) to procurement (based on Table 1).

	Agile trials (PV)	Traditional approach (NPM)
Level of centralisation	Bottom-up, decentralised	Top-down, centralised
Level of technology	Up-to-date	Time-lagged
Involvement of stakeholders	Open approach	Closed approach
First stage cost	Higher initial investment	Lower initial investment
Public value added in		
Quality of services	High	Medium
Achievement of outcomes	High	Medium
Trust in institutions	Medium to High	Low to Medium

public sector is not fully open to implementing agile methods when the solution is outsourced as it is typically locked-into the procurement regulations that require all products and services to be specified in depth prior the procurement. In other words, it is not possible to develop a purchased bicycle into e-bike or motorcycle once the technology approves. Therefore, the local governments can either increase in-house development or, alternatively, introduce more agile methods to get the best specifications for the procured solutions. One tool, described in this paper, is to introduce agile trials before full-scale procurement. Agile trials are bottom-up and decentralised (see also Table 4), attract the state-of-the-art technologies, and have the potential to generate more public value.

There is limited empirical evidence how agile trials work. This paper analysed the implementation of agile trials in two capital areas in in the Northern Europe. Although the project *Finest Smart Mobility* that included fast trials before procurement started only in late 2016, there is already the first evidence that this allows local governments of Tallinn, Helsinki and Vantaa to gain a better understanding of new technologies and attract more local companies to experimenting with new solutions for the public use.

7. Conclusions

This paper proposes a new way to manage government performances within the framework of PV with novel dimensions: adaptive and agile governance. The main research question (RQ1) was interested how agile and adaptive governance contributes to public value and it was replied by three sub-questions. The sub-questions were focused on the interplay between agile and adaptive governance and three domains of PV: quality of services, trust in institutions and achievement of social outcomes. These questions were analysed via recent empirical evidence in the case of cities of Helsinki and Tallinn. As the results of this particular case study, city governments can effectively improve the design mobility services (quality of services – Research Question 2), reduce CO2 emissions (achievement social outcomes- Research Question 3), and create trust in institutions (Research Question 4) while at the same time being adaptive and agile.

Appendix 1. Agile pilots online application form

Contact person name *

Contact person full name, title, telephone number, and other contact details

Contact person Email *

Email will be the main form of communication with the proposers

Organisation name *

Organisation business ID

Name or topic of the fast innovation trial *

Brief description of the fast innovation trial: How would you use the money?

Maximum 2 paragraphs of text describing your proposal. Please note that we are procuring fast innovation trials: a limited-time service, or a service prototype or a service concept, what with we can better understand the implications of emerging new technologies and business models. Describe your ambition in trial in the maturity level: do you expect to deliver a concept (PPT), prototype (service testable by our project experts in lab or in field), or a real service with real end-users for limited time. For the last option, mention limitations (for example "2 weeks" or "max 10 users").

Who would execute the trial in your organisation?

Team members and their roles in the trial. Add in a web-link to a prior reference for the persons, if you think this helps us evaluate better. No CV is necessary.

Your proposed price of the trial (in EUR, including VAT)

Total budget including VAT (note: a fixed sum between 2.000€ and 15.000€). Only fixed cost trials are allowed.

What are the tasks and deliverables, and their schedule

Maximum one line of text per task and per deliverable. Mention delivery month of the deliverable, and the IPRs for each deliverable. The default will be that all of the IPR ownership of all deliverables remains with you - we buy service trials limited in time. But we will require to have free, open usage rights for any general insights we learned regarding the technology or the business model, as well as a public presentation material about the trial.

How do you think your proposal would help us plan better smart mobility solutions?

Does it give any insight in the future procurement of smart mobility solution? Does it give us new ways to think about mobility planning or management? Are the proposed technologies or business models innovative enough?

What would you need from us in order to execute the trial?

Do you expect us, or someone else than you, participate in the execution or planning of the trial? How, when, and how much? What else would you expect? Have you identified critical external interfaces you need in order to deliver the trial?

Do you give us right to use the deliverables in the project next stage planning and promotion? *

I give my permission to use our pilot and project results as a reference material in communication of FinEst Smart Mobility project.

- Yes
- No

Public two paragraph text presentation of your trial

The public introduction of the innovation trial will be published in the project page. Maximum 500 characters.

Lähetä / Send

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