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The Demise of eGovernment Maturity Models: Framework and Case Studies

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Declaration:
Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology has not been submitted for doctoral or equivalent academic degree.

Morten Meyerhoff Nielsen

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signature

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E-valitsemise küpsusmudelite ammendumine: raamistik ja juhtumianalüüsid

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Abbreviations

AI	Artificial Intelligence
CIO	Chief Information Officer
GCIO	Government Chief Information Officer
CCP model	Context, Content, Process model
CMMI model	Capability Maturity Model Integration model
EC	European Commission
eDemocracy	Electronic Democracy
eGovernance	Electronic Governance
eGovernment	Electronic Government
eID	Electronic Identity
eParticipation	Electronic Participation
eSignature	Electronic Signature
eService	Electronic Service
EU	European Union
Gbps	Gigabytes per second
GDP	Gross Domestic Product
IS	Information System
IT	Information Technology
ICT	Information and Communication Technology
ITU	International Telecommunication Union
IoT	Internet of Things
JUG	Joined-Up Government
Mbps	Megabytes per second
OECD	Organisation for Economic Cooperation and Development
PA	Public Administration
PPP	Purchasing Power Parity
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
WEF	World Economic Forum

List of Publications

The list of author's publications, on the basis of which the thesis has been prepared:

I **Meyerhoff Nielsen, M. (2016).** E-governance and stage models: analysis of identified models and selected Eurasian experiences in digitising citizen service delivery. In: J. Wai, ed., *Electronic Government*, vol. 13(4). pp. 107–141. doi: 10.1504/EG.2016.076132 (ETIS 1.1).

II **Meyerhoff Nielsen, M. (2017).** Governance failure in light of Government 3.0: Foundations for building next generation eGovernment maturity models. In: A. Ojo and J. Millard, eds., *Government 3.0 – Next Generation Government Technology Infrastructure and Services Opportunities, Enabling Technologies, Challenges and Roadmaps*, *PAIT – Public Administration and Information Technology*, vol. 32. Heidelberg: Springer, pp. 63–110. doi: 10.1007/978-3-319-63743-3 (ETIS 3.1).

III **Meyerhoff Nielsen, M. (2017).** eGovernance and cooperation models for online service supply and citizen use: A comparative analysis of Denmark and Japan. In: Q. Zhu and N. Edelmann, eds., *JeDEM – Journal of eDemocracy and Open Government: CeDEM Issue: Best Papers from CeDEM Asia 16 and CeDEM17 Conferences*, vol. 9(2). Danube University: Krems an der Donau, pp. 68–107. doi: 10.29379/jedem.v9i2.487 (ETIS 1.2).

IV **Meyerhoff Nielsen, M. (2016).** The Role of Governance, Cooperation, and eService Use in Current eGovernment Stage Models. In: *2016 49th Hawaii International Conference on System Sciences (HICSS-49) Conference proceedings*, vol. 49. New York: IEEE, pp. 2850–2860. doi: 10.1109/HICSS.2016.357 (ETIS 3.1).

V **Meyerhoff Nielsen, M., Lopes, N. V., Soares, D. F. M. G. S. and Tavares, A. F. F. (2017).** Research Gaps in ICT-enabled Public Service Delivery. In: R. Baguma, R. Dé and T. Janowski, eds., *ICEGOV '17: Proceedings of the 10th International Conference on Theory and Practice of Electronic Governance*, vol. 10. New York: ACM, pp. 465–474. doi: 10.1145/3047273.3047388 (ETIS 3.1).

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VI **Meyerhoff Nielsen, M. (2016).** Digitising a small island state: A lesson in Faroese. ICEGOV conference proceedings In: J. Bertot, E. Estevez and S. Mellouli, eds., *ICEGOV '15–16: Proceedings of the 9th International Conference on Theory and Practice of Electronic Governance*, vol. 9. New York: ACM, pp. 54–59. doi: 10.1145/2910019.2910042 (ETIS 3.1).

VII **Meyerhoff Nielsen, M. (2017**). eGovernance and Online Service Delivery in Estonia. In: C. Hinnant and A. Ojo, eds., *DG.O 2017 – 18th International Digital Government Research Conference on Digital Government Research*, vol. 18. New York: ACM, pp. 300–309. doi: 10.1145/3085228.3085284 (ETIS 3.1).

VIII **Meyerhoff Nielsen, M. and Goderdzishvili, N. (2017**). Georgia on my mind: a study of the role of governance and cooperation in online service delivery in the Caucasus. In: M. Janssen, K. Axelsson, O. Glassey, B. Klievink, R. Krimmer, I. Lindgren, P. Parycek, H. J. Scholl and D. Trutnev, eds., *16th IFIP WG 8.5 International Conference, EGOV 2017, St. Petersburg, Russia, September 4–7, 2017, Proceedings*, vol. 16. Heidelberg: Springer, pp. 71–91. doi: 10.1007/978-3-319-64677-0_7 (ETIS 3.1).

Author's Contribution to the Publications

Contribution to the papers in this thesis are:

V The author of this thesis is both the corresponding and lead author. The author was responsible for coordinating the paper and final quality control and wrote approximately one-third of the paper. The co-authors contributed significantly to the review of literature and analysis and in this way secured the overall scientific quality of the paper, especially the theoretical part.

VII The author of this thesis is both the corresponding and lead author. The author was responsible for coordinating the paper and final quality control and wrote approximately two-thirds of the paper. The co-author contributed significantly to data collection in Georgia, setting up interviews for later validation, and in unearthing the role and importance of personal and informal networks in Georgia.

1 Introduction

"*Our shared challenge is to reduce digital inequality, to build digital capacity and ensure that new technologies are on our side and are a force for good" – Antonio Guterres, Secretary General of the United Nations, 7 June 2019 (Guterres, 2019)*

This thesis explores how governments approach Information and Communication Technology (ICT) to produce and deliver public services to their citizens. Few, if any, deny the profound and increasing impact of ICT on our everyday social life and working life. Whether the world is on the threshold of a new industrial-technical revolution as proposed by e.g. Schwab (2016), Brynjolfsson and McAfee (2012) or is in the middle of an ICT-based paradigm shift, as emphasised by Perez (2010, 2013), it is apt to explore the use of ICT in the public sector and authorities' approaches to technology.

The significance of the thesis's focus on public-sector use of technology is two-fold. First, ICT is widely recognised as a vehicle for wide-ranging transformation. Improved accessibility and affordability of access to the Internet and smart devices is transforming the manner in which authorities and citizens interact and how public services are manifested and delivered as emphasised by e.g. Ngini, Furnell and Ghita (2002), Savoldelli, Codagnone and Misuraca (2014) and the OECD (2001). The demographic, economic, and environmental challenges faced are widely acknowledged as increasingly putting pressure on the public sector and service delivery. ICTs as enablers of increasing efficiency, effectiveness, and transformation have long been recognised as part of the solution, thus the emergence of the term electronic government (eGovernment) (UNDESA, 2014; OECD, 2014).

Second, technological diffusion adds value for management, engineering, finance, trade and commerce, etc., which has been emphasised repeatedly (Davis, 1989; Venkatesh and Davis, 2000; Krishnan, Teo and Lymm, 2017). Technologically enabled value creation is neither a linear process nor a guarantee (de Bri and Bannister, 2015). Illustrated in terms of national experiences, the potential of ICT has not always been fully realised, failed ICT initiatives exist and digitisation at times led to increased inefficiencies (Gauld, Goldfinch and Horsburgh, 2010; Leitner et al., 2003; OECD, 2014). This emphasises the importance of local contexts and in particular the potential role of government to competently and effectively manage successful socio-economic transition brought about and enabled by technological change (Janowski, 2015; Panagiotopoulos, Klievink and Cordella, 2019; Perez, 2009).

Public-sector reform is not new. ICT in various forms has been applied for over a century, but with the US Department of Defence's invention of the Internet in the 1960s the pace with which digital means are applied for reinventing the public sector has increased apace (Fountain, 2008; Heeks, 2001; Tat-Kei Ho, 2002). Drawing on the linear and Fordist manufacturing and production models, New Public Management (NPM) has been one approach to public-service reform since the 1970s (Osborne, 2018). Various approaches have been developed by governments, international organisations, and consultancies since the 1990s in an attempt to guide, monitor, and measure the use of technology in the public sector and for service provision. Such approaches are often classified as eGovernment stage or maturity models (henceforth eGovernment maturity models). Their aim is to identify transformational stages of the technological adoption of public-sector service provision. Most of them are sequential in their approach, and map capabilities, maturity, and progress in eGovernment and

eGovernance literature. Layne and Lee (2001), Andersen and Henriksen (2006), Fath-Allah et al. (2016), Heeks (2005, 2015), Klievink and Janssen (2009), Moon (2002), Traunmüller and Wimmer (2003), and West (2004) have all reported the usefulness of eGovernment stage and maturity models as tools for guiding decision makers and spurring on the development of capabilities required for countries to shift from one stage to another, albeit from different perspectives.

The changing academic focus is reflected in research on the use of ICT by the public sector. The shift has been from evaluation and measurement of the maturity of public-sector take-up of technology (from the late 1990s), to preconditions, contextual and environmental issues, such as infrastructure, digital literacy, decision-making. The availability and type of online service provisions generally preceded the analysis of factors affecting their actual use and the impact of eGovernment, e.g. effectiveness, efficiency, equity. More recently cloud solutions, the Internet of Things (IoT) and Smart Cities have received a great deal of attention. Data analytics, Artificial Intelligence (AI), decision-making (e.g. eParticipation and eDemocracy), agility, co-creation and design thinking, open and whole-of-government approaches have also been in vogue (Bannister and Connolly, 2012; Criado, 2018; Scholl, 2013).

In summary, these eGovernment maturity models can be considered frameworks[1] and classified as being either normative, positive, or evaluator. For instance, Layne and Lee (2001, p. 135), who state that their approach offers a path for governments to follow, can be considered an example of a normative model (i.e. a prescriptive model of what influencing factors are in play and a model to emulate, see Cordes, 1997 and Desmarais-Tremblay, 2014). The maturity model proposed by Hiller and Belanger (2001) is a clear example of a positive model (i.e. a model which points to relationships between variables and factors at play, see Musgrave, 1959 and Desmarais-Tremblay, 2014). The United Nations (UN) eGovernment Survey and its associated benchmark (UNDESA, 2019), in turn, are evaluatory or evaluation models (i.e. a model measuring the change between two states of affairs, see Willmott, 1982).

Nonetheless, the vast majority of approaches mix two or more of these three elements. Some, like the Waseda Index and Accenture's approach, incorporate all three. The European Union's (EU) Digital Economy and Society Index (DESI) (EC, 2019) and West (2004) are both normative and evaluatory as they recommend specific focal areas and benchmark countries or organisations accordingly. By comparison, Dias and Gomes (2014), Iribarren et al. (2008) and Janowski (2015) are positive and evaluatory in nature but with normative elements for emulation.

The importance of different models is hard to assess, but their impact should not be underestimated. For instance, national and international benchmarks and indexes are seemingly used to direct developments, and for key strategic and government investment decisions. International benchmarks such as the EU DESI and the UN biannual eGovernment Development Index[2] prove to be particularly influential. National

[1] This thesis differentiates between two types of framework: Theoretical frameworks defined as a general representation of relationships between things in a given phenomenon and conceptual frameworks defined as specific sets of factors, concepts or variables, according to which the research must be undertaken (Maxwell, 2012; Miles and Huberman, 1994).

[2] For instance, a general search of the United Nation (UN) biannual "e-government development index" or "UN e-government survey" results in over 58,200 hits and 37,000 hits on Google Scholar. Adding "2018" as the year of the latest edition of the survey and a country name such as "Estonia" to the search on Google

assessment frameworks are similarly influential, like the former Bedst-på-Nettet and Guldlänken in Denmark and Sweden, or current awards of excellence in Dubai and Oman. Other examples included frameworks adapted for analysing services and quality in municipalities (Dias and Gomes, 2014; Sá, Rocha, and Cota, 2016; West, 2004), ICT use in Mexican states (Almazan and Gil-Garcia, 2008), national one-stop portals (Fath-Allah et al., 2016), open government civic engagement through social media (Lee and Kwak, 2012), business processes (Röglinger, Pöppelbuß and Becker, 2012; Rosemann and Bruin, 2005), or understanding the use of ICT in emerging economies (Joshi and Islam, 2018).

Meanwhile, critics of stage and maturity models cite their simplistic, generic, sequential, and technologically deterministic view on development, lack of solid theoretical foundations (de Bri and Bannister, 2015), and their lack of citizens' perspectives (Andersen and Henriksen, 2006; Lee and Kwak, 2012). Other criticisms include their failure to address the role of management in benefit realisation and risk mitigation (Irani, Al-Sebie and Elliman, 2006), or their lack of empirical evidence validating normative models (Coursey and Norris, 2008; de Bri and Bannister, 2015).

To address past critiques, authors such as Andersen and Henriksen (2006), Klievink and Janssen (2009) as well as Persson and Goldkuhl (2005) propose an outcome-based approach, but do so from a purely conceptual angle with no practical solution being offered or tested. Remenyi, Money and Bannister (2007) suggested a multi-dimensional perspective for measuring the value-for-money of ICT investments, viewed as lacking in most approaches, but these perspectives were neither developed further nor tested. More practical solutions include international benchmarks from the EU (EC, 2019), the UN (UNDESA, 2018b, 2019) and Waseda (Obi, 2017), but these tend to focus on the existence of preconditions such as Internet infrastructure and availability of certain types of online service provision, rather than actual use and value creation (DFS, 2019).

Many others address past criticisms by proposing new variations on previous models, but the proposals tend to focus on semantics, the realignment of existing elements, or on adding single emerging topics, such as Smart Cities, interoperability, big and open data (Gottschalk, 2009; Kalampokis, Tambouris and Tarabanis, 2011), eDemocracy, eParticipation or the uptake of social media (Falco and Kleinhans, 2018; Janowski, 2015; Lee and Kwak, 2012).

In short, none of the frameworks, targeting policy-makers, proposed to date seems to adequately address the main research question (RQ):

How to improve the public sector's approach to the successful provision and citizens' actual use of online public services?

As the research question resulting from the gap identified in the literature is a broad one, this thesis breaks it down into three sub-questions:

- First this thesis focuses on what frameworks have been suggested for providing value adding online public-sector services to citizens (SQ1);
- Based on the findings (in SQ1), the thesis explores how the identified frameworks correspond to country practices (SQ2);

Scholar results in approximately 1200 hits, whilst a general search on Google will result in 2.91 million hits as a consequence (search on 22 February 2020).

- Depending on the findings (in SQ2) this thesis will, where relevant, explore how the frameworks can be revised to better include the country practices and academic findings (SQ3).

Addressing the main research question and the three sub-questions, this thesis draws on five original (core) peer-reviewed publications (**I**–**V**) and is supported by an additional three in the appendix (**VI**–**VIII**). Drawing on the eight original publications, the thesis first outlines the methodology and approach of the thesis and publications (section 2). The thesis contributes to existing research in at least three ways. First, it reviews existing literature to identify what frameworks have been suggested for providing value-adding online public-sector services to citizens (SQ1). The analysis is used to develop a potential multi-dimensional framework for the case studies (section 3) and is primarily based on publications (**I**, **II**, **IV**, **V**). In doing so, publication (**I**) explores supply- and demand-side issues relating to public-sector service provisions and citizens' actual use of them. Publication (**I**) identifies eGovernment maturity models as a sub-category of research proposing specific approaches for ICT use and digital transformation of the public sector and service delivery. Publication (**II**) identifies and analyses 42 eGovernment maturity models. The high level of attention paid to maturity models in both academic circles and by national authorities stems from their use by international organisations, consultancies, governments and academics to guide, frame, assess and benchmark different governments' performance in relation to public-sector uptake of technology, not least to provide online services. Publication (**II**) is supported by publication (**IV**), which reviews three strands of literature addressing public-sector uptake of technology, that is: ICT-enabled reform in research on Public Administration, research into eGovernment, and Information Systems management. Publication (**V**) takes a more in-depth look at ICT-enabled public-service delivery in eGovernment, specifically in literature.

Second, to explore how the identified frameworks correspond to country practices (SQ2), the findings of publication (**II**) are compared to actual national approaches, in order to explore the second research question (SQ2); and a five-country cross-case comparison using the multi-dimensional framework is presented (section 4). The aim of publications (**III**, **VI**, **VII**, **VIII**) is to explore whether the approaches suggested hold up to national practices and whether the gaps and weaknesses of existing eGovernment maturity models found in publication (**II**) are also reflected in the countries' actual use of ICT and the delivery of services online. The publications not only explore the approach pursued by five different countries since 2000 but gather data in order to attempt to measure potential outcomes of the approaches followed in the five countries.

Third, in light of the review of the academic literature and the case-study findings, the thesis address how the frameworks can be revised to better include the country practices and academic findings (SQ3) (in section 5). The thesis concludes with summaries of its contribution to academic research (section 6).

2 Methodology

A three-pronged (or phased) approach is used to explore the thesis's core research question of **how to improve public-sector approaches to the successful provision and citizens' actual use of online public services (RQ)**. First, a structured review of existing literature is carried out to explore whether the research question addresses an existing gap in research. Having identified eGovernment maturity models as an area of potential interest, the literature review is expanded to identify existing models. Based on the review of literature, a metasynthesis analysis is carried out to determine what frameworks have been suggested for providing value-adding online public-sector services to citizens (SQ1). Second of all, based on the metasynthesis analysis, a number of case studies are developed for cross-case comparison to explore how the identified frameworks correspond to country practices (SQ2). Lastly, the thesis draws on the eight original publications to examine, where relevant, how the frameworks can be revised to better include the country practices and academic findings (SQ3) and can be developed in the three-pronged approach (illustrated in Figure 1) to synthesise the findings.

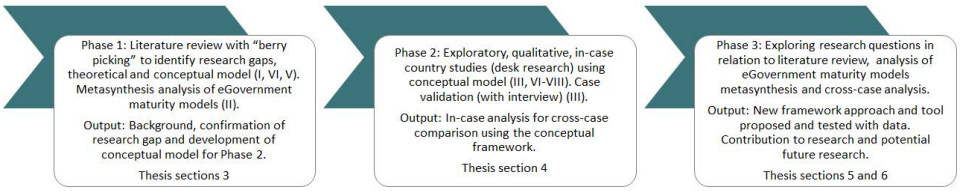


Figure 1. Three-phased research approach (source: author)

Phase 1 – Literature review and metasynthesis analysis

Existing literature is reviewed (**I**, **VI**, **V**) in order to check whether the overarching research question has already been addressed in literature and to develop a potential conceptual framework for the thesis. The review of literature follows a traditional pattern for systematic information retrieval as outlined by Roberts (1977) and Walsh and Downe (2005) for identifying relevant research. Walsh and Downe's (2005) seven-step model was adapted to include "berrypicking" (Bates, 1989; **IV**, **V**). The seven steps involve: framing the research question; purpose and aim of the review; locating relevant studies; deciding what to include; appraising literature identified; comparing and contrasting research; making conclusions. The aim is to validate the existence of a potential research gap and to justify the main research question of this thesis.

Keyword searches (i.e., *eGovernment or service, eService, online service or development, model, framework*) are made in the Web of Science (Reuters, 2015), Scopus (Elsevier, 2015), and the E-Government Reference Library version 10.5 (University of Washington, 2015) databases in order to provide a framework for the review and to locate relevant literature. Complementary sources include Google Scholar, ResearchGate, and non-academic reports relating to eGovernment maturity models, benchmarks and rankings. In order to more closely frame and refine the review parameters, only English-language academic studies, at least seven pages long, published by peer-reviewed academic conferences, academic journals, or international organisations since 1995 are considered (**IV**, **V**).

The research identified is appraised, compared and contrasted, in order to identify clusters of different studies and in order to identify potential frameworks and concepts

proposed in light of the overarching research question. The eGovernment maturity models are found to be of particular interest and relevance. A more narrowly confined keyword-based review of literature (i.e. *eGovernment stage* or *model*, *level*, *tier* or *development*) is conducted in order to identify relevant models and concepts for further analysis. The same parameters as the previous literature review were used (Roberts, 1977; Walsh and Downe, 2005).

An analysis of meta stages and meta characteristics is helpful (Walsh and Downe, 2005) for comparisons and for contrasting the various eGovernment maturity models identified in the closely confined review of literature. Using a qualitative metasynthesis framework to explore similarities between the various models also addresses semantic variations for similar ideas and concepts (Sandelowski, Docherty and Emden, 1997). The aim of the mapping exercise is to identify homogeneity or heterogeneity, strengths and weaknesses thereby pinpointing potential gaps in literature (Sandelowski, Docherty and Emden, 1997). Lee's (2010) metasynthesis framework is used, as it constitutes the most in-depth attempt to systematically synthesise and compare eGovernment maturity models. Preconditions are added to Lee's five meta stages as this helps establish a contextual background and helps with ex-ante/ex-post evaluation of potential impacts. The resulting six metaphors are defined in Table 1 below **(II)**.

Table 1. Metaphors: their definitions, related stages, and themes (source: adapted by author from Lee, 2010)

Metaphors	Description	Stages/Concepts	
		Citizens and Services	Operation and Technology
Pre-conditions	Existence of relevant human abilities and skills (i.e. digital literacy for using ICT), the availability of a technical infrastructure (i.e. access to the Internet), the existence of online service provision (i.e. websites and eServices)		
Presentation	Presenting information in the information space	Information	
Assimilation	Assimilates (or replicates) processes and services in the information space with the ones in the real world.	Interaction	Integration
Reforming	Reforming the processes and services in the real world to match the information space requirements, fitting for efficiency	Transaction	Streamlining
Morphing	Changing the shape and scope of processes and services in the information space as well as the ones in the real world, fitting for effectiveness	Participation	Transforming
eGovernance	Processes and services in both worlds are managed simultaneously, reflecting changes involving citizens with reconfigurable processes and services	Involvement	Process management

As a result of the phase 1 literature review and analysis, a conceptual model is proposed for phase 2's multi-country comparison. The conceptual approach is based on Symons' (1991) context, content, process model (CCP model) as used by Devos et al. (2007). Adapted by Krimmer (2012) in relation to the introduction and use of electronic voting and voting technology, the CCP model is particularly interesting for this thesis's focus on online services and its cross-case.[3]

[3] Symons' (1991) CCP model, is adapted by Krimmer (2012) to ICT use in electoral processes. As a result of the literature review and thesis's case studies and their focus on online services (proposed in section 3), Krimmer's CCP model has been adapted by the author.

Phase 2 – Exploratory case study

Following the literature review and the development of the conceptual model in phase 1, the case-study publications (i.e. **III**, **VI**–**VIII**) are based on a classical exploratory, qualitative, cross-case comparative approach (Benbasat et al., 2013; Rohlfing, 2012; Yin, 2013). This approach establishes a conceptual framework for in-case analysis and cross-case comparison utilising the conceptual framework developed in phase 1. The aim of the in-case analysis is to identify which mechanisms are at play in each case and to determine whether the eGovernment maturity models correspond to countries' practical approaches to eGovernment, and online service delivery in particular (**III**, **VI**–**VIII**).

As with any cross-case analysis, the tension between the universality and uniqueness of the case needs to be balanced with the need for a more general understanding of the generic processes across cases and time (Miles et al., 1994). The cases were therefore selected using purposive sampling, so they represent different socio-economic contexts (Miles and Huberman, 1994; Onwuegbuzie and Leech, 2007). The purposive sample was fine-tuned with convenience sampling, i.e. those cases judged to have relevant information available and where access to data and interviews could be ensured (Onwuegbuzie and Leech, 2007; Qureshi, 2018). The Faroe Islands (**VI**), Denmark (**III**), Estonia (**VII**), Georgia (**VIII**), and Japan (**III**) are used as cases to identify any potential commonalities in relation to public-sector technology use and ICT-enabled service delivery and the proposed eGovernment maturity models. Their different historical experiences, respective population sizes, socio-economic contexts, government structures, stakeholders, approached eGovernment, and ICT-enabled service delivery at various points in time will help isolate any commonalities. The case experience of public-sector technology use and service delivery, in turn link this to the review of literature (**IV**, **V**) and the analysis of eGovernment maturity models (**II**).

In terms of population, all five countries are considered nation states with a single dominant ethnic group, language, and culture – although Estonia features a large Russian-speaking minority and Georgia has strong regional identities. The populations are stable or ageing in all these countries. The size of the population for the different countries varies, ranging from a micro-dependency (Faroe Islands), to small and medium-sized countries (Estonia, Georgia, and Denmark), and finally to a large, relatively decentralised country (Japan).

In economic terms – defined as Gross Domestic Product (GDP) per capita at Purchasing Power Parity (PPP) – the countries range from low-income countries (Georgia), to medium-income (Estonia), to high-income (Faroe Islands, Denmark, and Japan) (**III**, **VI**–**VIII**).

With respect to the conceptual framework, the five countries represent different government structures and a variety of stakeholder influences. Denmark, Estonia[4], Georgia and Japan all have regional and local authorities. Danish regions focus on healthcare, with around 80% of all public services being delivery by municipalities directly or on behalf of central government. All Danish municipalities have extensive online service portfolios. Japanese regional prefectures are responsible for areas such as urban planning, welfare, health and hygiene, except when transferred to the local level in the twenty city municipalities exceeding half a million inhabitants. Local

[4] Note: The bulk of this thesis research, including Estonian interviews, were carried out in 2016 and 2017, i.e. before the Estonian structural reform of municipalities was completed in October 2017.

authorities are as a result responsible for between 60 and 70% of all service delivery to citizens, but with vastly different online-service portfolios. Estonian counties and Georgian regions by comparison have little actual service-delivery responsibility. While service delivery is increasingly decentralised in both Estonia and Georgia, it is currently limited compared to Denmark and Japan. That said, larger urban areas, such as Tallinn, Tartu (both in Estonia), Tbilisi and Batumi (both in Georgia), do offer a number of online services, but largely consisting of online information rather than two-way digital transactions. The Faroes by comparison have no regions and except for larger urban municipalities, local authorities provide few services online.

The five countries embraced ICT in the public sector at different times. Denmark, Estonia and Japan have all been considered global good practices for the last two decades, with Estonia regarded by many as a world leader in public-sector innovation and ICT and Japan with a heavy infrastructure and hardware focus (**III**, **VII**). Georgia and the Faroe Islands are relative "late movers". Georgia embraced technology as an enabling tool of public-sector reform, while the Faroe Islands by comparison are a late-comer (**VI**, **VIII**).

To develop each case, desk-top research was first carried out using the same methodology and sources as in phase 1. That is a traditional pattern for systematic information retrieval outlined by Roberts (1977), Walsh and Downe (2005). Second, semi-structured interviews (Bryman and Bell, 2015) lasting between 45 and 90 minutes were carried out in the native language of the interviewee or in English, in order to validate and complement desk research findings.[5] The objective and value of the interviews is to shed light on actual forms of coordination and cooperation, something that is neither reflected in official policy documents or organigrams, nor captured by previous research or policy documents – including the author's desk-top research and analysis.

References to interviews are anonymised with the intention of doing this being confirmed at the beginning of each interview. The aim of the anonymised interviews is to facilitate responses from interviewees which are as frank and forthcoming as possible. All interviews were recorded, with written notes being made by the author/interviewer, including a post-interview summary. Summary notes included a complete list of interview dates, times, locations, interviewee names, their occupations, contact details, and organisations. In order to identify patterns across interviews, the summaries were coded using basic codes relating to the core research questions, e.g. governance model, intergovernmental cooperation, availability of eServices, use of eServices, channel strategy, portal, degree of digitisation.

A total of 46 interviews with 64 interviewees from central and local government, academia, and the private sector were carried out in the Faroe Islands, Denmark, Estonia, Georgia and Japan. The variation in the number of interviews and interviewees is the result of different national set-ups, numbers of stakeholders and availability. The mix of stakeholders interviewed is nonetheless similar for all five countries. Table 2

[5] As recommended by Bryman and Bell (2015) all interviewees received a copy of the interview guide at least four weeks prior to the scheduled interview. The interview guide included information on objectives of the research interview, the list of potential questions covered, information on confidentiality, privacy, anonymity, data protection plus contact details for the Research Ethics Committee of the University of Tartu, if an interviewee should have any ethical concerns.

outlines the number of interviews, the period during which they were conducted and the number and type of stakeholders the interviewees represent.

Table 2. Number and type of interviews and interviewees per country (source: author)

Country	Interview period	Number of interviews	Number of interviewees
Faroe Islands	5–26 June 2015	9	9
Denmark	4–11 May 2017	10	15
Estonia	19 January and 2–29 May 2017	13	13
Georgia	25 May 2015, 9 February and 1–2 June 2017	6	11
Japan	29 November–2 December 2016, and 17 May 2017	6	16
Total		46	64

Phase 3 – Conclusions and a new multi-dimensional framework

Based on phase 2 (i.e. **II**, **VI**, **V**) and the in-case analysis (i.e. **VI**–**VIII**), the cross-case comparison (i.e. **III**) is used in phase 3 to determine whether any interrelationship exists between the eGovernment maturity models, and how countries approach eGovernment and in particular online service delivery in practice. The comparison helps address the main research question and the three sub-questions and thus also the overarching question addressed by this thesis. Phase 3 concludes by discussing the findings of the review of literature and metasynthesis analysis (phase 1) and the study of actual practice in five selected countries (phase 2). The findings of phases 1 and 2 are used to propose a new multi-dimensional framework for governments to approach service delivery supported by technology. Using 2012–2016 data collected during case studies (phase 2), the proposed multi-dimensional framework is populated with data collected during the case studies, and a tool is proposed for monitoring and measuring the availability of infrastructure and online services as well as the utilisation of these.

To summarise the methodology approach (see also Figure 1), in section 3 this thesis will present the results of the phase 1 literature review, the metasynthesis analysis of the eGovernment maturity models and develop the theoretical and conceptual model for the case studies (**I**, **II**, **VI**, **V**). In section 4 the results of the phase 2 exploratory, qualitative, in-case analysis for cross-case comparison using the conceptual framework will be presented and analysed (**III**, **VI**–**VIII**). Section 5 will explore the research questions in relation to literature review, analysis of eGovernment maturity-model metasynthesis and cross-case analysis and propose a new framework approach and test this with data collected for Denmark (**III**) and Estonia (**VII**). Section 6 concludes by summarising this thesis's contribution to research and potential avenues for future research.

3 Review of literature

In order to develop a conceptual framework for the thesis, this section outlines the research focus of three strands of literature and the analysis of all eGovernment maturity models identified. Combining findings of the review of literature with past approaches and frameworks, a new multi-dimensional framework (or conceptual model) is then proposed.

3.1 From eGovernment to governance of Digital Transformation

Using the methodology for systematic information retrieval outlined in section 2, publication (**IV**) finds that the policy focus and academic research on the use of ICT in public administration have changed over time. Researchers such as Bannister (2011), Brown and Grant (2005), Heeks (2005), Heeks and Bailur (2007), Scholl (2013), Yildiz (2007), Ljupčo et al. (2015), Criado (2018), and Draheim et al. (2020) illustrate the changing focus of academic discourses. From the 1990s on the initial focus was on measuring and evaluating the maturity of ICT in public administrations. This was followed by an analysis of preconditions and contextual issues, such as awareness of online service provisions and the potential of ICT, digital divide, trust and infrastructure, etc. The focus shifted towards evaluating the availability of eGovernment services, service types and technical solutions (i.e. supply, maturity level, etc.), but the focus subsequently moved on. First to the actual take-up of eGovernment solutions such as demand, usage, the hiatus between interest and use, influences affecting their use, etc. Then, the evaluation of eGovernment impacts, such as effectiveness, efficiency, equity, etc. were prominent. Of late, the innovative use of new technologies, such as Artificial Intelligence (AI), decision-making (e.g. eParticipation and eDemocracy), co-creation and design thinking methods, open and whole-of-government approaches, smart and sustainable cities and Internet of Things (IoT) have been in vogue. Whilst the policy focus of eGovernment has broadened the technocratic narrative of increased efficiency, effectiveness and quality nonetheless continue to dominate eGovernment literature (Draheim et al., 2020; **IV**, **V**).

As the eGovernment field of research has changed it has also matured. The term "electronic government" was first coined in 1993 by the US National Performance Review, becoming a prominent term around 1997 (Heeks and Bailur, 2007). IT and technology have, nevertheless, played a role in the delivery of public-sector services for over a century, but increased rapidly from the middle of the 20th century on. For instance, Gammon, in his 1954 review article on automatic handling of paper work, used the common definition of eGovernment as coined in 1997 (Gammon, 1954; Garson, 2006; **IV**), thus reflecting the emergence of technology and an ICT-enabled industrial revolution and digital transformation. For the purpose of this thesis, electronic government (eGovernment) is defined as "the use of ICT and its application by government for the provision of information and public services to the people" (UNDESA, 2014, p. 2). By contrast, electronic governance (eGovernance) encompasses all processes of governing, whether carried out by a government, market or network, whether over a family, tribe, formal or informal organisation or territory, and whether implemented through laws, norms, authority or language (UNDESA, 2014) (**IV**). For focus, this thesis uses McGregor's (1982) narrow definition of a public service, that is a service provided by a government to people living within its jurisdiction, either directly (through the public sector) or by financing the provision of the service. The focus is on

citizen-orientated “core” public services, i.e. those services whose use is required for proof of identity, to obtain permits (e.g. for construction, to drive a car), to receive support (e.g. pensions, child allowance) etc. (Meyerhoff Nielsen and Krimmer, 2015). The narrow definition of public service helps focus this thesis. While not covered by this thesis, the narrow definition does not exclude related concepts such as co-creation and innovation, which may in fact be facilitated by intergovernmental collaboration and collaboration with end-users and stakeholders (Jonas and Roth, 2017).

Academic and policy research is found to consist largely of case studies or theorising over the general introduction of ICT in public administration (PA), as illustrated by Leitner et al. (2003), Millard and Undheim (2007), Huijboom et al. (2009) or the OECD (2011, 2014, 2016) (**IV**). In literature covering Public Administration, many authors, e.g. Turner and Hulme (1997), Frederickson et al. (2012), Drechsler and Randma-Liiv (2014), have examined governance and stakeholder dynamics in the public sector, Dunleavy et al. (2006) being an early example of this, with regard to the digital era. Others, like Brown and Magill (1994), Heeks (2001, 2005) Heeks and Bailur (2007), Bannister and Connolly (2011), Pollitt and Bouckaert (2011, 2017), Cordella and Bonina (2012), have researched governance and cooperation with regard to public-sector use of technology, but largely in relation to ICT-enabled public-sector reform and not the impact of government service provision or benefit realisation as such (**IV**, **V**). By way of comparison, Heeks (2001, 2005) tackles implementation, project management and governance, with others, like Tat-Kei Ho (2002) and Fountain (2004, 2008), focusing on governance, institutional reform but also public service delivery (Fountain, 2004).

In information systems (IS), management research by Brown and Magill (1994), Brown and Grant (2005), Ross, Weill and Robertson (2006), Iribarren et al. (2008), Klischewski and Scholl (2008), Pöppelbuß et al. (2011) largely focused on the use of technology within single organisations or private-sector multinationals rather than the public sector at large or service delivery specifically to citizens (**II**). In literature on eGovernment (and eGovernance), the governance and cooperation angles have been covered, e.g., by Heeks and Bailur (2007), Fountain (2001, 2004, 2008), Millard et al. (2008), Huijboom et al. (2009), van den Broek et al. (2010), but are limited in relation to the outcomes of utilisation of ICT in public-sector delivery of services to citizens. As a response, authors like Ae Chun, Luna-Reyes and Sandoval-Almazan (2012) and Klievink, Bharosa and Tan (2016) argue that collaborative approaches combining value-driven, citizen-driven, cost- and technology-focussed forces are more likely to lead to successful outcomes, including the utilisation of online service provisions. Others have highlighted open government and co-creation as drivers of change, with Lee and Kwak (2012), Pizzicannella (2010) and Schmidthuber et al. (2017) being examples of this. Interestingly, co-creation drivers identified by McBride et al. (2018) all directly or indirectly involve the public sector. The drivers identified include motivated stakeholders, innovative leaders, proper communication, an existing open government data portal, external funding, and agile development (McBride et al., 2018).

New engagement forms, processes, innovation of services and organisations are by no means easy. Improved inter-organisational collaboration, development and deployment of new governance and cooperation tools and models is required to facilitate change (Torfing and Triantafillou, 2013). Authors as diverse as the OECD (2014), Osborne (2018), Torfing and Triantafillou (2013), and Burke (2014) in her review of Wright’s (1978) classical text on intergovernmental relationship all argue that some kind of proactive steering, even from a distance, is required. The objective is to design

and ensure the functioning of new governance, intergovernmental cooperation, and service-delivery models. Either as a source of data and funding, to help drive motivation, innovation, and communication around the co-creation process and have a more open and agile approach to service design, production, and delivery. Rather than merely adding the end-user to the process of service design, it is the use which creates the performance and value of a public service, with the public sector acting as facilitator of this process (Jonas and Roth, 2017; Osborne, 2018). This not only emphasises the need to look at actual use as a factor for measuring value creation for a given eService, but highlights the role of governance and intergovernmental cooperation in facilitating the digital transformation of service delivery (Anke, Pöppelbuß and Alt, 2020; Panagiotopoulos, Klievink and Cordella, 2019). This has also been emphasised in relation to public procurement and innovation (Kalvet, 2012), in how to overcome barriers to once-only principles (Wimmer et al., 2017), co-creation (McBride et al., 2019), smart cities (Viale Pereira et al., 2017), how the EU accession process has strengthened public-sector governance and changed intergovernmental cooperation in Central and Eastern European countries (Sarapuu, 2013), and a variety of other topics. This is indirectly supported by the empirical longitude study of UNDESA EGDI data for 2003–2018, for 193 countries, indicating that leap-frogging countries have generally applied continuous strategic cycles, driven by a core vision or agency (Martins et al., 2019). This is partially contradicted by a data analysis of 183 countries conducted by Krishnan, Teo and Lymm (2017), which found that ICT infrastructure and human capital are positively associated with the government's willingness to implement eParticipation and eGovernment, while governance was not significantly associated with this, rather indicating that the relationship between governance and the level of eGovernment "maturity" was not necessarily mediated by government willingness to implement eParticipation initiatives (Krishnan, Teo and Lymm, 2017). This contrasts with the so-called eGovernment maturity models, which largely focus on the introduction of ICT to government as a whole and often address online service offerings to citizens and businesses (**IV**).

Past criticism includes blindly digitising existing processes (Bannister, 2001; de Bri and Bannister, 2010; Traunmüller and Wimmer, 2003), throwing light on technological details, or introducing IT and technology without looking at the outcomes and added value (Janssen, Charalabidis and Zuiderwijk, 2012; Lips, 2012; **IV**). In relation to the impact of ICT and citizens' use of online services, PA literature has seen the emergence of a number of new paradigms over time. Pollitt and Bouckaert (2017) compare post-Weber research to geological sediments with new layers built up on top of existing research. These "paradigmettes" include both NPM, public value, Joined-up Government (JUG) or whole-of-government approaches (Drechsler and Randma-Liiv, 2014) and digital-era governance (Dunleavy et al., 2006). Put simply, the literature on ICT-enabled PA reform has a solid understanding of government and service delivery, although some strands, such as NPM, are seen by some as a flawed model (Osborne, 2018; Dunleavy et al., 2006; Drechsler and Randma-Liiv, 2014). Having dominated public service reform since the 1970s until the recent past, the critique of NPM is the pre-occupation with linear and Fordist models of public service delivery, seen in manufacturing and production literature. This does not adequately mirror the increasingly complex, fragmented and interdependent reality of public-sector governance and management of public service production and delivery (Osborne, Radnor and Nasi, 2013), including factors at play in the provision and citizens'

subsequent uptake of online services. Digital-era governance is a reversal of NPM priorities and orientation (Dunleavy et al., 2006). It is argued, in turn, that digital NPM is a selective adoption of efficiency over fundamentally reengineering the approach to public-sector service production and delivery to citizens proposed by digital-era governance (Dunleavy et al., 2006; Drechsler and Randma-Liiv, 2014). As with IT governance literature, essential elements are proposed, but none of the strands of research appear to propose adequate models for improving government approaches to successful provision (i.e. provision/input) and citizens' use of online public services (i.e. demand/output) (**IV**).

The field of eGovernment has been debating theoretical foundations since the 1990s. Some authors, like Heeks and Bailur (2007), proposed that distinct and deep theorisation is required. Still others, like Bannister and Connolly (2015), argue that the cross-disciplinary nature of eGovernment justifies adopting and adapting theories and theoretical frameworks from other disciplines. (**IV**). Whether one supports the need for a grand eGovernment theory or not, the eGovernment maturity models are a strand of academic discourse which have proposed numerous general frameworks (of both a conceptual and a theoretical nature) in order to help better understand public-sector utilisation of ICT and online service delivery, in particular, to which this thesis now turns. In a similar vein, it has been debated whether there is justification to specifically refer to "electronic" or not (Lips, 2012).

3.2 An analysis of eGovernment maturity models

Inspired by IS management, which has long used models for designing and evaluating systems, Sambamurthy and Zmud (1999) argue that different forces interact and reinforce, dominate or conflict with one another. The eGovernment maturity models are often hybrids of behavioural-science and design-science models. Many of the models' initial stages have been observed empirically, while later stages are aspirational (de Bri and Bannister, 2015; **IV**). Three primary modes of information-technology (IT) governance, information-system (IS) management and capability maturity models (CMM) have prevailed since the 1980s: Centralised, decentralised or federal modes for introducing ICT. Whilst IS management and the CMM models address political and legal dimensions, most focus on business processes in single organisations, not the cross-organisational, national, or international ones seen in the PA and eGovernment literature. In short, a limited analysis of the "multi-headed beast" that is the public sector is identified by CMM models (**IV**).

In this context, a number of developmental eGovernment maturity models have been proposed, which are also based on technical, organisational and managerial feasibilities and corresponding examples. With the use of ICT in public administration and public-service delivery often referred to as chaotic and uncoordinated, the aim of eGovernment maturity models has also been two-fold: to understand and evaluate progress including benchmarking organisations and countries. The implication is that their use has often been viewed as guides for policy and decision-making (Layne and Lee, 2001; Siau and Long, 2005; **II**, **IV**). Like their IS management counterparts, eGovernment maturity models are based on the assumption that change enabled by ICT occurs in a predictable pattern of evolution and change. Thus, eGovernment maturity models generally involve a set of a sequence of levels (or stages) which together form an anticipated, desired, or logical path from the initial state to maturity (Becker, Knackstedt and Pöppelbuß, 2009; Gottschalk, 2009; Kazanjian and Drazin,

1989). This implies that each level of maturity indicates an organisation's current or desirable capabilities in relation to a classification scheme (Rosemann and Bruin, 2005; **IV**).

The first eGovernment maturity models were developed by national auditors in Australia, Sweden and the United Kingdom, and subsequently embraced by consultancy companies and international organisations. Layne and Lee (2001) were amongst the first academics in eGovernment literature to argue for dividing development into distinguishable stages of maturity. Based on models developed by national authorities, Layne and Lee's (2001) four-stage model remains the most widely cited and influential model of eGovernment maturity. The Layne and Lee maturity model continues to form the basis for the majority of subsequent academic eGovernment maturity models and international benchmarks, such as the UN eGovernment Development Index (**II**). Subsequently, a sub-category of eGovernment research has focused on maturity models. Academia has developed maturity models for similar purposes, such as national authorities, international organisations, and consultancies: that is, as a common reference frame for understanding developmental stages of the use of ICT in public administration (Lee, 2010). As both Siau and Long (2005) and later Lee (2010) pointed out, eGovernment maturity models seem to be incongruent with one another as each adopts different perspectives and uses slightly different metaphors. This presents a challenge in understanding different research outcomes, but also in planning future actions for developing eGovernment. To date, eGovernment literature generally differentiates between three types of maturity models (Fath-Allah et al., 2014; Persson and Goldkuhl, 2005; **IV**):

- Governmental models developed by governments, consultants, and academics to help authorities identify and improve their level of maturity (generally using predefined models and toolkits).
- Holistic models designed to assist authorities (generally predefined models, toolkits and indicators) in project implementation and to determine whether the project will succeed or not.
- Evolutionary eGovernment maturity models based on sequential evolutionary steps, for instance from immature to mature eGovernment with enhanced quality.

This implies that eGovernment maturity models are often at risk of mixing positive (i.e. a model highlighting relationships between variables and factors), normative (i.e. a prescriptive model of what is at play and a model to emulate) and evaluatory elements (e.g. a benchmark for comparisons) (**IV**). In light of this, and borrowing aspects from Iversen, Nielsen and Norbjerg (1999) and Pöppelbuß and Röglinger (2011), eGovernment maturity models in the context of this thesis are defined narrowly *"as the assessment of an as-is situation, to derive and prioritize improvement measures, and to control progress*" (**II**).

As the holistic maturity models focusses on project implementation and organisational capabilities in a single organisation, as can be seen in the IS management and CMM literature (Persson and Goldkuhl, 2005; Ross, Weill and Robertson, 2006; Weill, 2004), the primary focus of this thesis's review is on maturity models related to public-sector ICT use for service production and delivery (**II**). Using the metasynthesis framework approach outlined in section 2, 42 stage models were identified, compared and contrasted. According to their origin, five (12%) stem from national authorities,

three (7%) from international organisations, four (10%) originate from consultancy firms, and the remaining thirty (71%) from the scientific community (**II**). The first eGovernment model was proposed by the Australian National Audit office in 1999 (NAO – National Audit Office, 2002), a mere six years after the term "eGovernment" was first coined by the US National Performance Review, and only a couple of years after the term first gained popularity (Heeks and Bailur, 2007) (**II**). More than half (23 or 55%) were published between 2000 and 2004 – including all models originating in international organisations and consultancies (**II**). Roughly half (22 or 52%) are based on case studies and actual experiences. Of these, the majority are based on observations in a single country and with a single level of government (15 or 36%), such as municipalities (3 or 7%) or regions (3 or 7%). Seven models (17%) are based on experiences and cross-country comparisons (**II**).

The authors' analysis of 42 different stage models identified eleven different stages from pre-conditions to transformation (or morphing) and eDemocracy. Models and their respective complexity and maturity levels (or stages) vary from simple models such as Reddick's (2004) two-stage model presenting information online and transactional eServices, and the World Bank's (Toasaki, 2003) three-stage model, which adds user engagement to Reddick's version. More complex models include Dias and Gomes' (2014) three-dimensional, 12-stage model, Waseda's four stages with seven cross-cutting themes (Obi, 2016), Iribarren et al. (2008) with five stages and 172 indicators, or the UN model with its four stages and over 200 indicators for their eGovernment Development Index (UNDESA, 2018b). It is interesting to observe that models such as Waseda (Obi, 2016), Heeks (2015), and Dias and Gomes (2014) rely heavily on borrowing from the CMM/CMMI models with their multi-dimensional approach, and also recommended by Remenyi, Money and Bannister (2007).

As the various models are based on different perspectives and use different definitions and metaphors, they can be difficult to understand and summarise (**II**). To alleviate this difficulty, the eleven meta-stages are further distilled using Lee's (2010) qualitative metasynthesis framework. Using twelve maturity models, Lee proposed a semantic framework consisting of five general metaphors, namely: Presenting, Assimilating, Reforming, Morphing, eGovernance. Adding pre-conditions, seen in many of the maturity models (benchmarking in particular), the specific meta characteristics of the 42 maturity models are mapped and presented in accordance with Lee's metasynthesis framework in Annex 1 – eGovernment maturity models mapped in accordance with Lee's qualitative metasynthesis framework.

Whilst much research refers to the eGovernment maturity models, the initial findings of the literature review (**V**, **VI**) indicate that they may act as an appropriate conceptual framework for this thesis and the case studies. The analysis nonetheless identifies five key weaknesses, related to: Preconditions, background indicators and outcomes; back-end integration and front-end service delivery; decision-making as a level of maturity; governance and cooperation approaches; and stakeholders and end-users. Each of these five areas are addressed in subsequent sections (**II**).

Preconditions, background indicators and outcomes

Whilst semantics and definitions vary in the eGovernment maturity models identified, the vast majority include different service elements or service types. Online information (or presenting) are elements found in 39 out of 42 models (93%), transactional services (or assimilation and transactions) in 38 models (91%), and a number include various

forms of "data" for successful online service delivery. Only 6 out of 42 models (14%) include preconditions, which makes it difficult to use the models to measure both relative progress and successful use of information-based websites or online transactional service solutions (**II**).

Preconditions and background indicators are essential, as they set the scene for ex-ante and ex-post evaluation of investment into ICT for public-service production and delivery both in back-office and front-office environments. Preconditions such as the availability of Internet infrastructure, literacy and digital skills are particularly important, as confirmed and statistically proven in publications (**I**) for twelve selected Baltic, Nordic, Central and Western European countries for the period 2008–2014 and again by a similar exercise for 208 countries and economies from 2010–2016 (Meyerhoff Nielsen, Rohman and Lopes, 2018). Both run year-on-year Spearman non-parametric correlation tests and confirm the positive relationship between the frequency of use and Internet access at home as being statistically more significant over time. The positive correlation between frequency of Internet use and the take-up of services such as eBanking and eCommerce is also proven here. The propensity to use public-sector eServices is found to be weaker and statistically less significant over time, emphasising the limitations of current research – in particular in relation to variables influencing citizens' uptake of online service offerings.

Models such as UN (UNDESA, 2018b), EU (EC, 2014), Waseda (Obi, 2016) and Iribarren et al. (2008) include preconditions. Rather than establishing usage, these models aim to enrich analysis and to monitor the availability of key enabling factors, such as digital literacy, Internet availability and use, availability of electronic identifiers (eID), bundles of online services, access to public-sector information, downloadable forms, and transactional eServices in aggregated terms. This means none of the models constitute practical tools to monitor and measure outcomes or to realise the benefit of investments in ICT-enabled service delivery (**II**).

Whilst different types of public service are used in multiple maturity models, the analysis of individual models indicates a limited understanding of core public-service delivery concepts. This is problematic for monitoring, measuring and comparing potential impacts. For instance, individual service elements such as information, transaction capability, and personal data are not necessarily separate maturity levels, but rather elements of a given service request and its subsequent production and delivery (Meyerhoff Nielsen and Krimmer, 2015). In a similar vein, a downloadable form is arguably a type of static information and, as such, does not warrant a separate maturity level (**II**). The limited insight into core public-service delivery is surprising, given that 22 (52%) of the 42 identified models claim to be based on practical experiences and case studies (see Annex 2 for an overview in summary form). In fact, 15 (36%) of the models are largely based on observations of ICT used in a single country and for a single tier of public administration (e.g. local, regional, or central). Seven (17%) of the models are based on experiences in multiple countries, i.e. Accenture (Rohleder and Jupp, 2003), UN (2018a), EU (EC, 2014), Iribarren et al. (2008), Janowski (2015), Wescott (2001), and West (2004). Three of the models (7%), as proposed by Windley (2002), Chen and Mirgins (2011), and Almazan and Gil-Garcia (2008), are based on regional observations in a single country, whereas Moon (2002), Norris and Reddick (2013), and Dias and Gomes (2014) (or 7%) based their research on case studies in municipalities (**II**).

Of the 42 models, four (10%) take a deductive approach, 18 (44%) are mainly inductive, eleven (26%) are largely abductive and nine (21%) seemingly use a mixed approach. In relation to the type of models proposed and their use by academics and practitioners, 18 (43%) mix positive and normative elements to some degree. Of these, eleven (26%) include some form of evaluatory elements or are used for assessments of performance – even if not formally intended as such by the maturity model authors.

A limited number of maturity models have attempted to address use and outcomes. When they do, they are largely descriptive and positive in nature (e.g. Andersen and Henriksen, 2006) or mix both descriptive, positive, and normative elements, without actually addressing online service usage (e.g. Klievink, Bharosa and Tan, 2016; Kim and Grant, 2010).

All seven (17%) models including evaluatory elements (e.g. ranking, benchmarks, indexes) incorporate normative elements, with six included which also have features of positive models. In relation to international benchmarking, discussions with member states and external experts took place whilst redesigning EU benchmarking prior to the 2012 assessment (leading to the current DESI format). Due to the limited availability of data and potential costs, a mystery shopper model was adopted rather than looking at actual usage (EC, 2014, 2019). Similar discussions have been included by the eGovernment expert group advising the UN on the eGovernment Development Index in the last few editions (UNDESA, 2019). Whether intended by eGovernment maturity models' authors or subsequently used by others, to measure public-sector technology use or citizens' usage of online services, they rarely constitute practical tools for these purposes and blur the purpose and usefulness of individual maturity models further.

Mixing up back-end integration and front-end service delivery

Similar to the concept of core public services, analysis shows that back-office integration and front-office service delivery is mixed up in many models. Rooted in customer contact theory, a back office is defined as that location where processes not directly involving the customer are carried out whereas a front office is defined as "where the customers are" (Lynn Shostack, 1982). This implies that a one-stop-shop portal does not constitute a service transaction, but indicates that authorities cooperate and strive for an integrated and a whole-of-government approach to service delivery (**II**).

Multiple models have addressed back-end integration and front-end service delivery. Evaluating a number of pre-2005 models, Persson and Goldkuhl (2005) propose a two-stage model with a clear computer-science perspective. Based on Layne and Lee (2001), their focus is on service integration (that is, services, directed services, concentrated services, and portals), including horizontal and vertical integration of organisations, processes, exchanging, and re-using data. Persson and Goldkuhl's data elements are similar to the Open Government Data Maturity Model proposed by Kalampokis, Tambouris and Tarabanis (2011) (**II**).

By contrast, the multi-dimensional eGOV-Maturity Model (Iribarren et al., 2008) includes both front office and back office, policy, management and organisational capabilities. Criticising Layne and Lee's model (2001) for being too linear and too "US-centric", the Manchester eGovernment Maturity Model (Heeks, 2015) also distinguishes between front office and back office, resulting in two parallel dimensions which form a matrix: one focusses on sophistication of digitised interactions (i.e. one- and two-way interaction plus transaction), whilst the other focusses on the process of

change (i.e. simple digitisation and automation, improvement process integration, redesigning/reform, and transformation). Thus, the Manchester eGovernment Maturity Model shares a number of similarities with Waseda (Obi, 2016) and the IT governance and CMM/CMMI approach of NASCIO (2006), Iribarren et al. (2008) and others. Unfortunately, none of these models address outcomes or the actual use of online service offerings (**II**).

Cooperation is indirectly addressed by all models addressing reform (i.e. 38 out of 42) and transformation (i.e. 36 out of 42) (**II**). None are found to address creating added value or suggest approaches to ensure back-office and front-office integration, or what is required from the authorities to move from one stage to another. IT governance and CMM/CMMI models, with their multi-dimensional perspectives, stand out as they include human, management, and organisational capacities with an impact on the potential success or failure of ICT use in the public sector (Davison, Wagner and Ma, 2005; Iribarren et al., 2008; NASCIO, 2006; Obi, 2015; **II**).

Klievink and Janssen's (2009) five-stage model is of particular interest. The level of customer orientation increases with every stage of the model, as does the level of flexibility, which includes: siloed and integrated organisations, national one-stop portals, inter-organisational integration, customer-driven service delivery, and joined-up government. Thus, the model reflects JUG (that is, integration) and outcome-based thinking found in PA and eGovernment literature (**II**).

Whilst all models include the presentation and publication of information and transactional eServices as stages in the progress, none of the models include actual use. This is unfortunate, as the added value of a website or eService comes from its use, not its mere existence. This is also in contrast to PA research on ICT-enabled public sector reform, where NPM is often seen to focus on efficiency and JUG tends to address effectiveness (Bannister, 2001; Bannister and Connolly, 2011; Cordella and Bonina, 2012; **II**).

The limited attention paid to outputs and results is surprising, considering the almost universal academic consensus of ICT as an enabler of public-sector reform and transformation. Similarly, maturity models are largely theoretical and provide neither models nor practical tools for authorities to use in their eGovernment endeavours.

Decision-making as a level of maturity

Multiple models and benchmarks have introduced decision-making as distinguished and advanced maturity levels, which is exemplified by eParticipation and eDemocracy, including Hiller and Belanger (2001), Deloitte and Touche (2001), World Bank (Toasaki, 2003), Moon (2002), Siau and Long (2005), Chan, Lau and Pan (2008), the UN eParticipation Index since 2013 (UNDESA, 2019), the EU benchmark since 2013 (EC, 2012, 2019), as well as Lee and Kwak (2012).

Whether facilitated by technology or not, decision-making, as exemplified by the eParticipation and eDemocracy stages, should not necessarily be considered an eGovernment maturity level. Dias and Gomes (2014) make this argument indirectly by defining engagement, petition, and voting solutions as types of public services. In fact, eParticipation and eDemocracy solutions consist of the same elements as other public services. That is information, transaction capability, or some form of data (Meyerhoff Nielsen and Krimmer, 2015). For online civic engagement, this would be information on when an election takes place and with what subject matter (i.e. information), a technical solution for engaging in discussions or casting a vote (i.e.

a transaction), and personal data, such as unique ID numbers, names, and addresses for authorising votes (i.e. data) (**II**).

Increased levels of transparency and engagement in government, political, and democratic processes is a laudable objective. Online engagement platforms and voting solutions can generate real efficiencies, effectiveness, quality and can add value. Many of the existing models seemingly were blind to the potential of technology to underpin or facilitate public engagement, even if eParticipation and eDemocracy stage(s) should not be considered eGovernment maturity levels, but rather an indication of democratic maturity and transparency (Dias and Gomes, 2014; **II**) or drivers of, e.g., collaborative and co-creation approaches (Ae Chun, Luna-Reyes and Sandoval-Almazan, 2012; Klievink, Bharosa and Tan, 2016; McBride et al., 2018).

Governance and cooperation approaches

The importance of the political and institutional framework in which policy change occurs is well established (Dawson and Robinson, 1963); Berry and Berry, 1990; May and Jochim, 2013), including how it facilitates cooperation, bargaining, and trade-offs (Axelrod and Hamilton, 1981; Lowi, 1969; Arrow, 2002). Governance and cooperation also feature in eGovernment literature (Wimmer and Von Bredow, 2002; McBride et al., 2019), as does past analysis (Krishnan, Teo and Lymm, 2017; Martins et al., 2019). The rationale for changing policy (Etzioni, 1967; Simon, 1993; Berry and Berry, 1990), or how institutional frameworks and socio-economic factors impact decision-making processes (North, 1991; Stone, 1998; Coase, 1960) is also highlighted by the literature in terms of economic crises (Raudla et al., 2015), leadership, strong political decision-making and networked governance relating to eGovernment (Kattel and Mergel, 2018; Wimmer and Von Bredow, 2002; McBride et al., 2019).

Recommendations by the OECD (2014), organisations and authors such as NASCIO (2006), Iribarren et al. (2008), and Janowski (2015) emphasise governance structures and cross-governmental cooperation as preconditions for a successful implementation of ICT and the realisation of benefits in the public sector. Important elements include mechanisms for governing decision-making, legal changes, prioritisation, coordination processes, funding, benefit realisation, and whether the eGovernment Strategy is legally binding for one or all levels of government (Meyerhoff Nielsen and Yasouka, 2014; OECD, 2014; **III**, **VI**–**VIII**).

Often eService development is rooted narrowly in existing organisational structures, without any vision on how those structures can be improved, relating to and supported by the legislative process and other drivers often attributed to successful public-sector innovations, such as effective leadership and coordination (EC, 2013; De Vries, Bekkers and Tummers, 2016). This narrow focus on technology as the strategic driver for improving public-sector efficiency often leads to failures in developing information systems and improved public-sector efficiency (EC, 2013; Krimmer et al., 2017). While similarities exist between the application of ICT in the public-private sector (e.g. eCommerce), government eServices are deemed to become increasingly complex as the focus shifts from technical and interaction issues to core business processes and strategic issues (Wimmer and Von Bredow, 2002). The complexity of end-users and the plethora of public-sector actors and levels of government emphasise the importance of governance and intergovernmental cooperation, particularly when combined with JUG and whole-of-government approaches combined with the systematic re-thinking and

re-engineering of the public sector, in part facilitated by ICT (Dunleavy et al., 2006; Drechsler and Randma-Liiv, 2014).

None of the maturity models identified address governance directly. Most models indirectly address cooperation in the form of vertical and horizontal integration, the existence of one-stop shops, information and data-sharing among authorities and governmental levels (**II**, **IV**). Some include private and third-party stakeholders' cooperation and partnerships (Chen and Mingins, 2011; Lee and Kwak, 2012). Others, such as the Waseda Index, highlight management and coordination issues, including the existence of chief information officers (CIOs) (Obi, 2012, 2014, 2015, 2016) (**I**, **II**, **IV**). By comparison, Lee's model includes management and governance issues in the final maturity level (Lee, 2010), in line with IT governance literature (Brown and Grant, 2005; Brown and Magill, 1994). Whilst most would agree on the importance of IT governance, the Waseda (2016), NASCIO (2006), Iribarren et al. (2008), Shareef et al. (2011) and Janowski (2015) models are the only ones addressing it directly by incorporating elements of governance, cooperation and promotion structures, management optimisation, and policy-driven eGovernment (**II**).

The weakness of the maturity models' limited focus on governance and cooperation is reinforced by the increasingly multi-disciplinary and cross-sectoral character of eGovernment over the last decade. The holistic approach to information systems' development is widely recognised both in theory (Wimmer and Von Bredow, 2002) and in empirical studies (Krimmer et al., 2017), for instance of specialised agencies and steering committees in the Faroes and Denmark (**III**, **VI**) or the leadership, public-sector ICT competencies, legislative and regulatory support (incl. standards), and the existence of (strategic) IT infrastructure in Estonia (Kalvet, 2012; OECD, 2015; **VII**) and to a lesser extent in Georgia and Japan (**III**, **VIII**). The influence of leadership, governance and intergovernmental cooperation found in the thesis's five cases is also supported by case studies on eGovernment in Australia, Latvia, the Republic of Korea, Singapore, and the United Kingdom (Chan, Lau and Pan, 2008; Ozols and Meyerhoff Nielsen, 2018; Meyerhoff Nielsen and Jordanoski, 2019). In fact, continuity and the continuous development in strategic focus over time that was found in the Danish and Estonian cases (**III**, **VII**) seemingly also are a key factor in countries which have leap-frogged up the UNDESA EGDI in the 2003–2018 period, countries such as Kazakhstan, Spain, Uruguay and the United Arab Emirates (Martins et al., 2019), while a lack of continuous strategic focus, coordination and leadership in cases such as Uganda, Saudi Arabia and South Africa have led to comparatively little progress (Martins et al., 2019; Meyerhoff Nielsen and Jordanoski, 2019; Meyerhoff Nielsen, Torres and Jordanoski, 2019).

Despite claims to act as models and practical tools for assessing and guiding public-sector use of ICT, eGovernment maturity models often mix normative and evaluatory elements, but less so positive elements (**II**, **IV**). An examination of the relationships between variables and factors in play is generally missing, as is illustrated by the lack of, e.g., measurements of output and outcomes. In relation to this thesis's research questions, this means that, for a given model to act as a practical tool, it should provide a governance or institutional framework, methodologies, procedures and tools for implementing technology in public administration, and for coordinating different activities and entities.

Stakeholders and end-users

The analysis of eGovernment maturity models demonstrates that few address the role of different stakeholders. Contrasting positions are taken in the PA literature, with Turner and Hulme (1997) outlining the underlying assumptions and themes. First, organisational change cannot be reduced to a technical fix. Second, the organisational environments, factors and forces defining the context in which an organisation operates are important. Third, organisations operate in a political context, with power and authority permeating stakeholder relationships. In brief, decision-making and management are activities involving conflicts, bargaining, coercion and coalition-building amongst groups and individuals, both inside and outside of a given organisation, or even outside the public sector as such (Turner and Hulme, 1997). Whilst the role of stakeholders in the introduction and citizens' subsequent take-up of eServices is unclear in the analysis of eGovernment maturity models (**II**), the PA literature does indeed recognise their importance. In fact, the attitude and role of individual stakeholders (Berry and Berry, 1990; Ingold, 2011), the bargaining process (Lowi, 1969) the way they interact, network and shape decisions is recognised as an important factor (Ostrom, 1971; Lewis-Beck, 1977; Arrow, 2002; Varda, 2009; Ingold, 2011). Expertise and experiences of individuals and groups in relation to an issue (Simon, 1993), external inspiration and practices (Berry and Berry, 1990) also influence decision-making, Similarly, the number, homogeneity, attitude and relevant power between different stakeholders (Varda, 2009) and whether processes are inclusive or exclusive in nature influence decisions (Olson, 1990). Likewise the impact of contextual socio-economic factors (Axelrod and Hamilton, 1981; Lowi, 1969; Arrow, 2002; Dawson and Robinson, 1963; Moe, 1984; Janowski, 2015; Raudla et al., 2015) influences stakeholders, and consequently decisions. It may therefore be expected that different stakeholders also shape and influence the strategic use of ICT in public-sector service productions and provisions in various ways, and with different degrees of influence and impact.

Some eGovernment maturity models, such as the Waseda index (Obi, 2012, 2014, 2015, 2016), the US Federal Enterprise Architecture (CIO Council, 2013) and the Chilean CMMI-inspired model and toolkit (Iribarren et al., 2008) do include government CIOs and management capabilities. Other potential stakeholders are only referred to indirectly. Others, like Chen and Mingins (2011), Lee and Kwak (2012), refer to various forms of partnerships with the private sector and third-party stakeholders.

In relation to governance and cooperation, authors such as Frederickson et al. (2012) propose that institutional and organisational relationships are influenced by jurisdictional boundaries, but these are less meaningful to the practical necessities or efficient policy implementation. With increased cross-governmental and intra-governmental cooperation, the importance of political and organisational boundaries becomes less important for efficient and effective policy-making, even service delivery, thus aligning to the eGovernment literature on ICT-enabled modernisation, breaking down organisational silos for user-centric service delivery (Garson, 2006; Fountain, 2004) and improved public-sector performance through one-stop portal, sharing and re-use of data, horizontal and vertical integration – elements seen in the majority of eGovernment maturity models (**I**, **II**).

It is therefore worthwhile to include stakeholders in the conceptual framework for case studies (see section 3.3). For the purpose of this thesis, stakeholders are identified, and illustrated in Figure 2, as (Krimmer, 2012; Nielsen et al., 2017):

- Central, regional, and local government, i.e. *authorities and staff* that propose, implement, and ensure compliance with regulations; *politicians* who react to issues and establish the objectives which must be achieved (e.g. collecting taxes, protecting a group, industry, or the environment);
- Society, i.e. *businesses* that develop new technology or specific solutions for authorities; *citizens* who use the services and react to them (e.g. ease of use, choice of delivery channel); *interest groups* such as consumer protection groups, employee and employers' organisations (e.g. trade unions and business associations), single-issue organisations (e.g. environmental protection groups or senior citizen groups), and *experts and academia* (e.g. topical or sectorial experts).

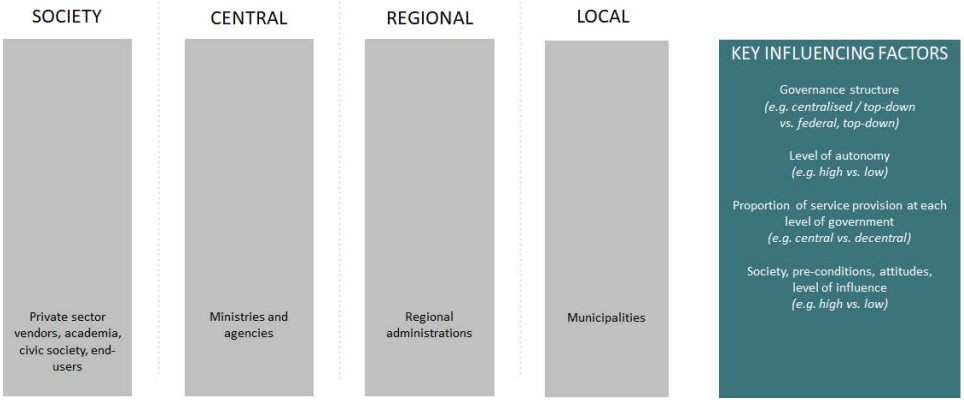


Figure 2. Stakeholders and key influencing factors (source: author)

3.3 Proposing a three-dimensional framework

To summarise, the metasynthesis analysis finds that current eGovernment maturity models may provide governments with a simple framework for providing online services for citizens (SQ1), creating added value, but it is uncertain how the identified frameworks correspond to country practices (SQ2). Although some models provide governments with simple tools for monitoring and measuring whether certain types of information and transactional services are available online, the outcomes are rarely addressed (Andersen and Henriksen, 2006; Cordella and Bonina, 2012; Kim and Grant, 2010). Where outcomes *are* in fact addressed, none provide guidance relating to citizens' use of said online services, let alone practical frameworks or monitoring tools – or which services citizens use. This reconfirms that the limited focus on value creation and benefit realisation persists when it comes to IT use in the public sector, as emphasised by, e.g., Janssen, Charalabidis and Zuiderwijk (2012) in relation to open data or by Lips (2012) in relation to public-sector digitisation and the findings of this thesis (**IV**). The challenges of increasing the uptake of digital service delivery channels and of increasing public-sector efficiency and effectiveness are also found to persist (**II**, **VI**).

Whilst recognised as significant by both practitioners and academics, the role of governance models and institutional frameworks, that is, the level of integration and cooperation between public authorities for ensuring the successful implementation of

national strategies for eGovernment (i.e. eGovernance), continues to be relatively poorly analysed (**IV**). Similarly, the literature review in section 3.1 did not uncover explanations for underlying reasons for countries with similar infrastructures and availability of eServices experiencing distinctly different levels of online interaction between citizens and the public sector, indicating that there is a potential need to examine government ICT in practice (**II**).

Developing a conceptual framework

A multi-country, cross-case analysis proves useful for comparing the proposed multi-dimensional framework model to actual practice. A conceptual framework is beneficial for structuring the individual and cross-case analysis. Symons' (1991) context, content, process model (CCP model) as used by Devos et al. (2007) is a useful basis for a conceptual framework to facilitate the cross-case comparison. Krimmer's (2012) CCP model for ICT use in electoral processes proves beneficial and is, for the purpose of this thesis, adapted based on the results of the review of literature (**I**). The proposed conceptual framework and the thesis focus on online services for citizens. The adapted conceptual framework (or CCP model) consists of four macro-dimensions, as illustrated in Figure 3 (**III**).

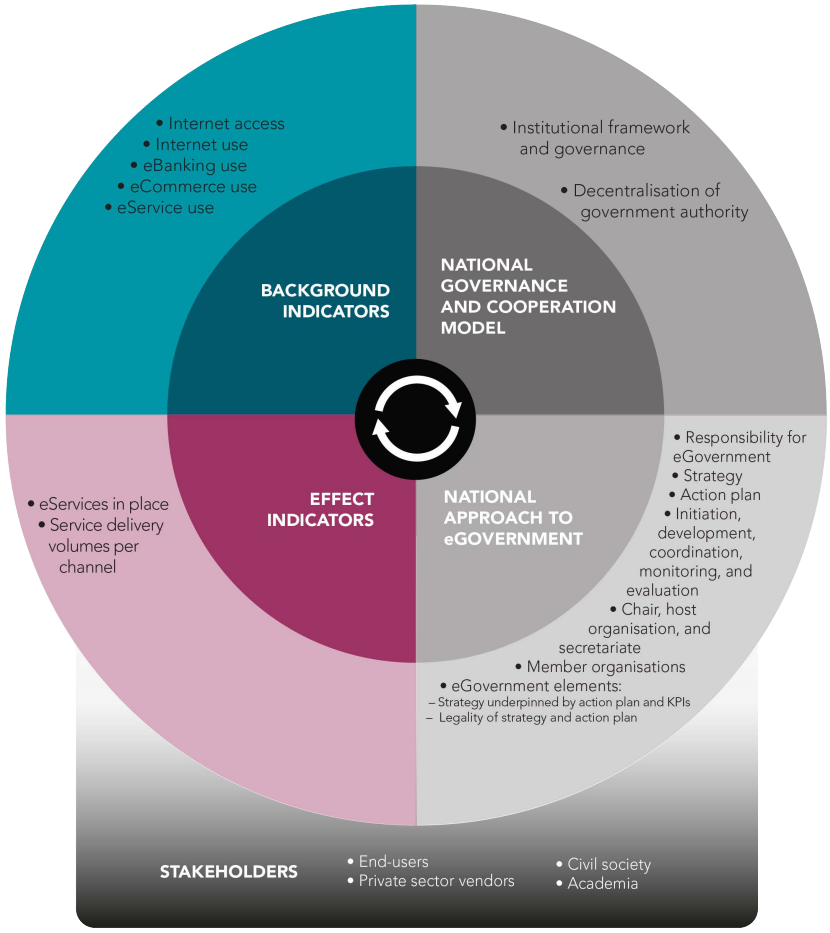


*Figure 3. Conceptual framework (source: author, based on (**III**) as adapted by author from Symons, 1991 and Krimmer, 2012)*

First, background (i.e. preconditions) and secondly effect (i.e. output or outcomes) are included help to establish the context and provide a basis for reviewing the ex-ante and ex-post measurement of ICT solutions and eServices introduced. Third, national governance and cooperation models are covered and includes national institutional frameworks and approaches to governance as well as the degree of decentralisation of government authority for decision-making and service delivery (i.e. with no focus on technology). Fourth, national approaches to eGovernment may vary from the third macro-dimension and is added, including responsibilities, mandates for initiating, coordinating, monitoring and evaluating strategies and progress and whether strategies and action plans are legally binding for relevant authorities. The thesis also covers the existence of specialised ICT agencies and government CIOs, strategic focus over time and whether measurable KPIs are in place. Each dimension explains a key area which influences processes, selections, and outcomes in relation to eService supply and take-up. Using the conceptual framework, this thesis identifies their respective strengths and weaknesses in relation to their respective approaches to ICT-enabled public-sector service delivery and eGovernment experiences. Whilst the conceptual framework forms the basis for publications (**III**, **VII**–**VIII**) and section 4 of this thesis, it has merit to combine it with elements previously proposed by the eGovernment maturity models analysed.

Combining the key elements found in both the CCP model and metasynthesis analysis of eGovernment maturity models, we can outline a new multi-dimensional framework to inspire and structure government thinking *vis-à-vis* online service delivery. However, a conceptual departure from the eGovernment maturity models' sequential approach is required. Leaving a few exemptions aside, attempts to address key weaknesses in the sequential stages of maturity have not taken public-sector realities (**I**, **II**, **IV**) into account. In fact, the focus on clearly defined, sequential stages must be replaced by one of parallel processes and staggered implementation of different key elements, as previously proposed by Remenyi, Money and Bannister (2007) and indirectly suggested by Iribarren et al. (2008) as well as Dias and Gomes (2014). To have value and be useful over time, any framework should be as independent of technology, equipment and devices as possible. In a similar vein, it should be possible to accommodate different service types. This will, in turn, also make the proposed multi-dimensional framework more generic. With this in mind, what would an appropriate framework look like? The proposed realignment is a three-dimensional framework which reuses elements from various existing eGovernment maturity models and adds a number of additional ones.

Preconditions and background dimensions

The first dimension of the proposed multi-dimensional framework consists of four components in two categories: preconditions, such as skills, infrastructure, and interrelated service production components, that is, production and provision of back and front office services.

Preconditions, such as availability of the Internet as well as general and digital literacy, are essential for the subsequent use of online service offerings. Internet availability and general and digital literacy are, therefore, the first two aspects which any government or authority needs to address (**I**, **II**, **IV**). Preconditions are found in a number of stage and maturity models, particularly from the international benchmarking models, including those of the EU (EC, 2019), UN (UNDESA, 2019) and the World Bank (Toasaki, 2003), from consultants such as Accenture (Rohleder and Jupp, 2003), and

academics like West (2004) and Obi (2017). The precondition factors can therefore be used. However, these need to be realigned for reuse.

General literacy, as well as digital literacy and infrastructure, whether via fixed or mobile technologies, could be staggered slightly to optimise the potential value added by investments. If staggered, we propose that the development of digital skills is prioritised via the rollout of an Internet infrastructure. This recommendation is based on the premise that skills are required to use the Internet infrastructure available (Meyerhoff Nielsen, Rohman and Lopes, 2018; DFS, 2019). Thus, if there is a lack of digital skills, this leads to a lack of added value created by investments in infrastructure – although it should be noted that the two are interdependent variables.

The production of public-sector services consists of two interrelated components: back-end production, that is, back-office systems, databases and processes required to deliver a given service, and front-end production, consisting of the analogue and digital front-end interphases through which a service is requested or delivered. The third and fourth components which governments and authorities should address are, therefore, back-office systems and front-end interphases for public-service delivery. Whilst these components are found in the majority of eGovernment maturity models, they must be realigned: Rather than being sequential stages they are generally found to be parallel. For instance, back-office IT systems for producing public services underpin all analogue and digital service-delivery channels; and back-office systems and front-end user interfaces are frequently interconnected (Remenyi, Money and Bannister, 2007; **III**, **VI**–**VIII**). Often, a back-end system can produce multiple service provisions and outcomes and is linked to or integrates different types of databases and registers. This means that back-office systems supporting public-service delivery will result in the highest potential return on investment. Similarly, eServices are generally linked to back-end systems as such; it is sensible to ensure that back-office systems are in place before launching a potential online service integration to said system (**III, VI**–**VIII**). Whilst the majority of back-end systems can be launched simultaneously with their eServices provisions to citizens, IS management literature (Iribarren et al., 2008; NASCIO, 2006) recommends that back-office processes are tested prior to launching a front-end service. This ensures a stabilised back-end system, also ensuring that operational processes are in place, thus minimising the risk of temporary problems when engaging with citizens. It is therefore beneficial to prioritise back-office systems over front-end service solutions.

Front-end interaction has traditionally consisted of service requests and subsequent production and delivery of said services. Increasingly, services are delivered proactively, personalised or even co-designed and co-produced with end-users. Essentially, a public service consists of information, transaction capabilities or personal data – or a combination of these. Service delivery therefore also relies on appropriate identity management and data to ensure the conditions for a given service are fulfilled (Meyerhoff Nielsen and Krimmer, 2015; Persson and Goldkuhl, 2005). This means that the third component should be able to accommodate data from different registers or registries, no matter where it is stored (Arendsen, van Engers and te Velde, 2006; Charalabidis and Psarras, 2009; Janssen, Charalabidis and Zuiderwijk, 2012). On the other hand, the fourth component should be able to accommodate key enablers, such as eID, digital signatures, and updates made by both back office staff and citizens to core data registers and systems. The fourth service production elements include key identifiers, such as eID and digital signatures, information-based services, such as websites, and transaction-based services, such as online applications. This logic is seen in

the majority of stage and maturity models, but contrary to these, the information-based and transaction-based services required are offered in parallel and should not be interpreted as different levels of maturity (Meyerhoff Nielsen and Krimmer, 2015; **I**, **II**, **IV**).

The aim of any governmental or organisational initiative must be being one step ahead of the curve, for instance, to ensure the infrastructure can both provide and handle the volumes of traffic and bandwidth required. This means the four components may be staggered at times, as illustrated in Figure 4. Different versions or phases of a given element lifecycle can be incorporated, including initial development and implementation, daily operation and maintenance, new versions, etc., by simply marking them as one would on a timeline. If deemed necessary, new technologies which replace old ones can be accommodated by the generic multi-dimensional framework proposed.

As a result of different contextual differences and approaches to service delivery, each of the four components in the proposed multi-dimensional framework can be based on an aggregation of multiple sub-elements. This is particularly beneficial in terms of changing strategic focus, technological development, etc., but also in terms of monitoring and measurement.

For instance, preconditions can be based on an aggregation of general and digital skills, different types of infrastructure, such as fixed or mobile Internet connectivity, or even different technologies, such as 2G or 5G network capacities, which can be accommodated and subsequently aggregated for monitoring and measurement. Similarly, service production can be based on the aggregation of one or more service areas and delivery channels (e.g. physical, paper-based, telephone or online).

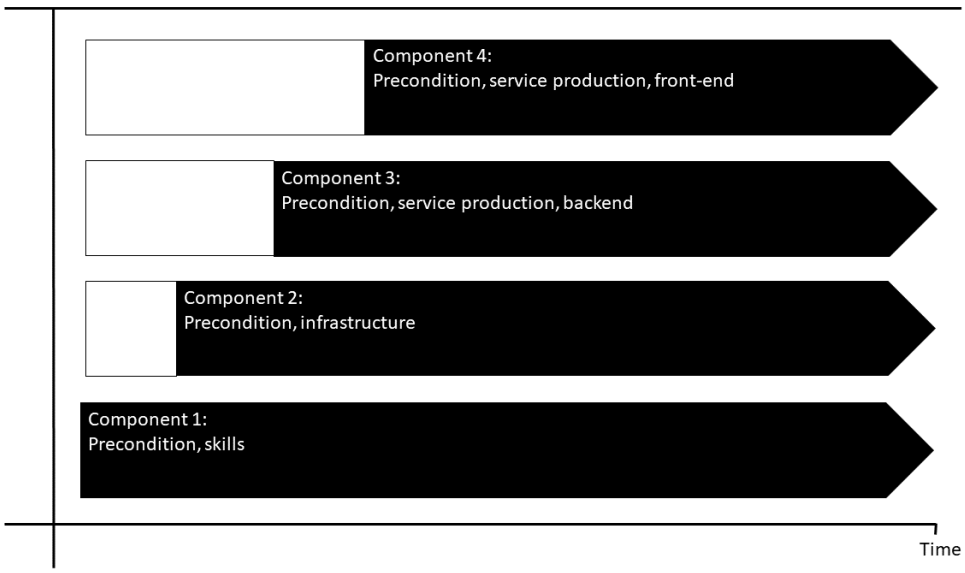


Figure 4. Staggered yet parallel processes (source: author)

Specific parameters may be added, such as availability and use of websites with government information or transactional online services, or personal and proactively delivered services for that matter. The ability to construct and deconstruct each of the components allows for different levels of granularity. Again, this ability is particularly useful for changes to strategic focus, technological development, and monitoring and

measuring change over time (see section 5 for more). Service production components are included in the first dimension together with skills and infrastructure, as they all are preconditions for a given outcome or effect measurement. This means that without the skill or competency, infrastructures cannot be used; without infrastructures, service production and delivery to citizens online is not possible; and without websites and services, no *(added)* value can be derived from their use.

Governance and stakeholder dimension

The second dimension covers governance, intergovernmental cooperation, responsibilities and stakeholders. The lack of any reference to governance and intergovernmental cooperation components is a weakness identified in the metasynthesis analysis, although these are found in the CCP model proposed by Symons (1991) and used by Krimmer (2012) for analysing ICT use in electoral processes (**I**, **II**, **IV**). General components identified include levels of government, local, regional, and national levels reflecting the political and institutional framework in which strategic and operational decisions are made (Dawson and Robinson, 1963; Berry and Berry, 1990; May and Jochim, 2013), including cooperation, bargaining, and trade-offs of different decisions (Axelrod and Hamilton, 1981; Lodge and Hood, 2012; Lowi, 1969; Arrow, 2002). Country-specific contexts specify the responsibilities in relation to skills, infrastructure, service production and the delivery elements already defined above (Berry and Berry, 1990; Varda, 2009; Ingold, 2011). Whilst these vary, these can be aggregated at each level as well as nationally. Therefore, a second dimension focuses on the partners and stakeholders responsible. Elements may be added or removed on a plug-and-play basis, depending on their expertise, relevance, and importance in a given context, strategic period or initiative (Berry and Berry, 1990; Varda, 2009; Ingold, 2011).

To allow for differentiated contexts, a shifting strategic focus and an inclusive decision making process (Olson, 1990; Berry and Berry, 1990; Varda, 2009), the first component in the governance and stakeholder dimension comprises local, regional, and national authorities (component 5) and staff who propose, implement, and ensure compliance with regulations (Etzioni, 1967; Lowi, 1969; Varda, 2009). This component is complemented by politicians (component 6), who react to issues and establish the objectives to achieve (e.g. collecting taxes, protecting a group, industry or the environment), businesses (component 7), who must comply with regulations or may suggest regulatory changes, and finally citizens (component 8), who react to an issue (e.g. consumer protection, safety, environmental protection), request, consume, co-produce or co-design services may also be introduced as components. Interest groups (component 9) such as consumer-protection groups, employees' and employers' organisations (e.g. trade unions and business associations), single-issue organisations (e.g. environmental protection groups or senior-citizen groups) are also influences in some cases, for instance, when representing end-users or acting as third parties in service production (Berry and Berry, 1990; Varda, 2009; Ingold, 2011). Lastly, experts and academia (element 10) (e.g. topical or sectorial experts) may be added for inclusion and relevance of their expertise (Olson, 1990; Varda, 2009; Krimmer, 2012; Nielsen et al., 2017).

The authorities' component (component 5) is made up of local, regional, and national authorities and may be used for monitoring and measurement over time, either as an individual sub-component or as a national aggregate of these (see section 5 for more). The conceptual approach is illustrated in Figure 5 (with a more hierarchical approach being explored in section 5).

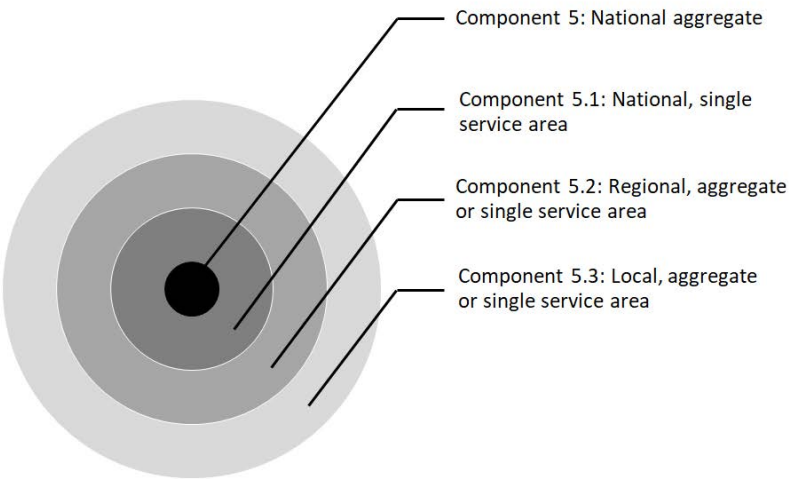


Figure 5. Public service delivery measurements and aggregation across levels of government, illustrative (source: author)

Legislation, standards, and capability dimensions

Whilst outside the core focus of this thesis, the third dimension includes legislation, standards and capabilities within government. Past research, the CCP approach, multiple eGovernment maturity models have highlighted the important role played by legislation, standards, capabilities within government, and individual authorities (**I**, **II**, **IV**). Legal and regulatory frameworks (component 11) are key elements regulating not only mandates and responsibilities, but the manner and extent to which technology can be used to deliver public-sector services, how data can be shared between organisations, how government is structured, whether eGovernment strategies and action plans are legally obligatory etc. The legal principles applied by the Danish government to ensure that legislation is "digitisation-ready" constitute an interesting attempt to ensure that the legislation and regulation focus on outcomes, rather than specific technologies or unintentionally limit ICT (DIGST, 2018; Meyerhoff Nielsen, Torres and Jordanoski, 2019). Standards (component 12) for interoperability, enterprise architecture, usability, identity and data management, data protection, privacy and cyber security are cross-cutting elements which either facilitate or hinder ICT-enabled public-sector reform and innovation (Kalvet, 2012; Wimmer et al., 2017; Ozols and Meyerhoff Nielsen, 2018).

Competences, organisational and financial resource capacities (component 13) not only underpin changes to legal and regulatory frameworks, but also assure the maintenance of and compliance with standards. They underpin innovation, change and project management processes, whether facilitated by technology or not (Krishnan, Teo and Lymm, 2017; Anke, Pöppelbuß and Alt, 2020).

A third dimension may, in principle, be added to the proposed model, but the benefit of doing so is subject to future research. That said, the components of the third dimension may be added to or removed from the multi-dimensional framework if and whenever they are relevant. For instance, the minimum standards for data protection and online usability (i.e. the parameters of component 12) may be added to the third dimensions (Wimmer and Von Bredow, 2002; McBride et al., 2019).

In terms of monitoring and measurement, compliance with said standards can then be evaluated either on a yes/no basis or using a Likert-scale. The Danish usability

requirements in this regard may be used for inspiration, as they include measurable (determinable) acceptance criteria for language use, form and functionality, for reusing components, compliance with standards and legislation, web-accessibility – even results of usability tests (DIGST, 2017b, 2017c).

Illustrating the new three-dimensional framework

Merging the different components into a three-dimensional matrix inspired by IS management models such as NASCIO (2006), Iribarren et al. (2008), Heeks (2015) Dias and Gomes (2014) is illustrated in Figure 6.

The proposed analytical and multi-dimensional framework provides a realigned way of addressing ICT-enabled service delivery. Being independent of technology and services, it provides flexibility in relation to strategic focus and technological developments and can be used in multiple contexts. This approach allows for elements to be adjusted, but also for new components to be added to the model or existing ones to be removed from the model over time on a "plug-and-play" basis. This provides a high degree of flexibility in relation to different national and organisational contexts, such as levels of government and distribution of responsibility and the types of services and delivery channels in focus over time. By doing so, the multi-dimensional framework allows for a contextualisation of the digital transformation of public-sector service delivery, and may potentially be used by governments to facilitate the positive contribution of new technologies during a techno-economic paradigm shift in public administration and society (Janowski, 2015).

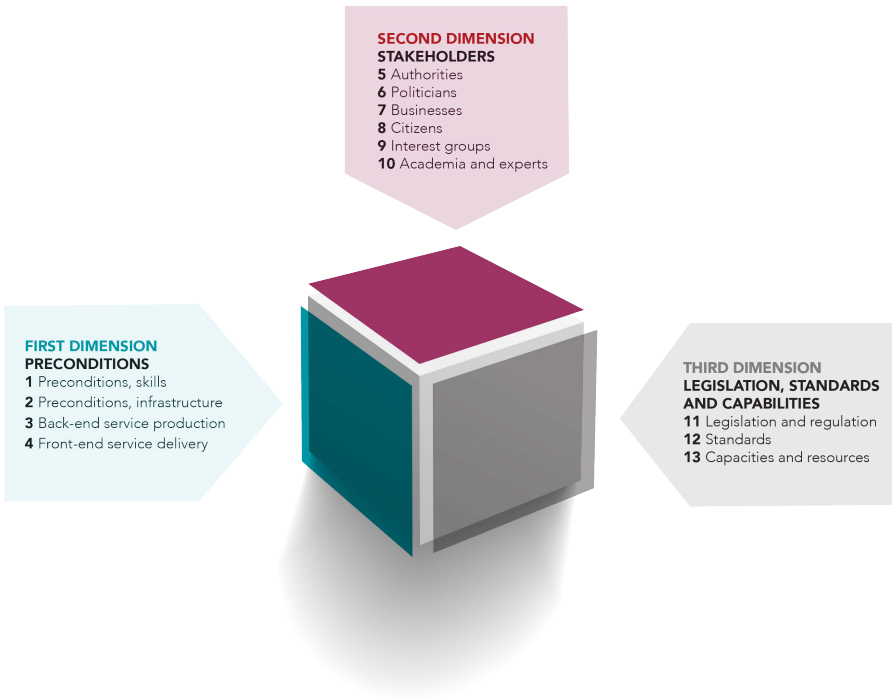


Figure 6. The three-dimensional framework (source: author)

The ability to construct, deconstruct and reconstruct different components is a particular strength of the multi-dimensional framework approach. Using examples from earlier in this section, the aggregation of skills (Component 1) and front-end service delivery (Component 4) is illustrated in Figure 7. The aggregation of different components can be completed for each element in each of the framework dimensions. Similarly, the level of granularity can, in theory, be conducted indefinitely, although this will increase the complexity of the multi-dimensional framework, especially in relation to data collection for monitoring and measuring individual dimensions and components. If deemed relevant, additional technology types may be applied to the infrastructure component (Component 2), e.g. by differentiating between say fixed and mobile connectivity, 4G versus 5G, or different bandwidths.

Two key critiques of past eGovernment maturity models include their disconnection from public-sector uses of technology and their limited focus on outcomes and creating added value. In this image, the generic conceptual framework model is proposed and illustrated in Figure 7 (**I**, **II**, **IV**), but needs to be held up and compared against actual government practice.

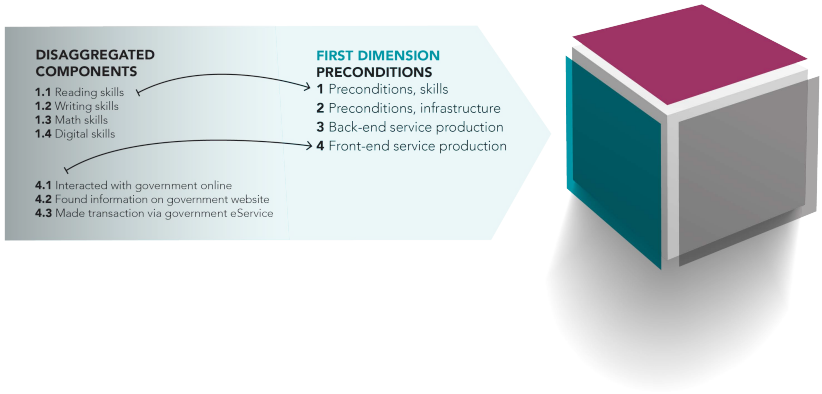


Figure 7 Example of disaggregated elements in the three-dimensional framework (source: author)

As seen in the literature review and metasynthesis analysis in sections 3.1 and 3.2, governments and international organisations such as the EU, OECD and UN traditionally focused on the availability of the Internet and eServices, key technical enablers such as data registers, eID and digital signatures (EC, 2014). A shift was observed towards effectiveness (OECD, 2014), accountability (UNDESA, 2014), and transparency and user centricity (EC, 2014) as critical enablers of eGovernment in 2014. Still, merely introducing technology does not yet guarantee success or create any additional added value. The challenge of increasing the use of digital service-delivery channels and of increasing public-sector efficiency and effectiveness therefore persists (**II**, **VI**). This reconfirms that the limited focus on creating added value and benefit realisation persists when it comes to IT use in the public sector, as emphasised by, e.g., Janssen, Charalabidis and Zuiderwijk (2012) in relation to open data or by Lips (2012) with regard to public-sector digitisation and the findings of this thesis (**IV**).

Whilst recognised as important by both practitioners and academics alike, the role of governance models and institutional frameworks, that is, the level of integration and

cooperation between public authorities to ensure successful implementation of national strategies for eGovernment (i.e. eGovernance), remains relatively poorly analysed (**IV**). Similarly, the review of literature neither unearths explanations nor underlying reasons for countries with similar infrastructures and eService availability experiencing very different levels of online interaction between citizens and the public sector, thus indicating that there is a need to examine government ICT practices (**II**).

4 Cross-country analysis

How does the proposed three-dimensional framework correspond to reality, based on findings of the literature review and the metasynthesis analysis? And in particular, how do the findings relate to different country contexts and respective approaches to eGovernment and the technology used to produce and deliver public services, and how appropriate is the three-dimensional framework?

Using the conceptual model and the three-dimensional framework proposed in section 3.3, this section looks at the approach to eGovernment and online delivery of services in five countries. First, this section outlines the five national approaches to ICT in order to identify practical eGovernment patterns. This is followed by national approaches to preconditions such as back-end and front-end elements (i.e. dimension 1). Whilst background and effect indicators are collected during the case studies (i.e. **III**, **VI**–**VIII**), they will be used to populate the proposed multi-dimensional framework in the subsequent section (section 5). In line with the CCP model and the proposed three-dimensional model governance, intergovernmental cooperation, responsibilities and stakeholders are addressed (i.e. dimension 2), before interesting elements are outlined with regard to legislation, standards and capacities (i.e. dimension 3).

4.1 National approaches to eGovernment over time

The use of ICT and eGovernment strategies varies within organisations and countries over time. Generally, eGovernment strategies aim to increase the efficiency and effectiveness of the delivery of public-sector services, modernisation or even wholesale transformation of public administration and society at large (**IV**, **V**). Still, ICT investments do not always achieve the levels of efficiency and effectiveness envisaged. Some authorities and countries are, or have been, more successful in relative terms at using ICT endeavours than others – even where countries shared socio-economic similarities (**I**, **IV**, **V**).

As expected, national approaches to eGovernment and delivery of public services differ over time. Denmark introduced its first eGovernment strategy and action plan in 1995, with Estonia following in 1998, Japan in 2001, Georgia in 2014, whilst the Faroe Islands started working on their first eGovernment strategy and action plan in 2015 (**III**, **VI**–**VIII**). The lack of a formal eGovernment strategy does not imply that ICT has not been used in the public sector. Two cases stand out in this regard. The Faroe Islands, which implemented a fully digital healthcare system, including electronic journals for patients and electronic prescriptions in the early 2000s (**VI**), whilst Georgia actively used IT between 2004 and 2014 to underpin the re-engineering of processes and organisations as part of its public-sector modernisation reform and anti-corruption drive (Engvall, 2012; Goderdzishvili and Gvenetadze, 2014; **VIII**).

Whilst Lee's adapted metasynthesis framework (**II**) does not provide an adequate tool for analysing the use of ICT and strategic eGovernment and action plans from 1990, a pattern nevertheless emerges. The question is whether national patterns reflect the sequential approach of eGovernment maturity models. A historic overview, as summarised in Figure 8, is therefore helpful for comparing national approaches in the cases of the five countries to that of eGovernment stage and maturity models (**III**, **VI**–**VII**).

Going back to the 1990s and using the keywords in Figure 8, four general phases can be identified. First of all, initial uptake of ICT is generally sporadic and uncoordinated. There is neither a whole-of-government vision, nor any eGovernment strategies or action plans.

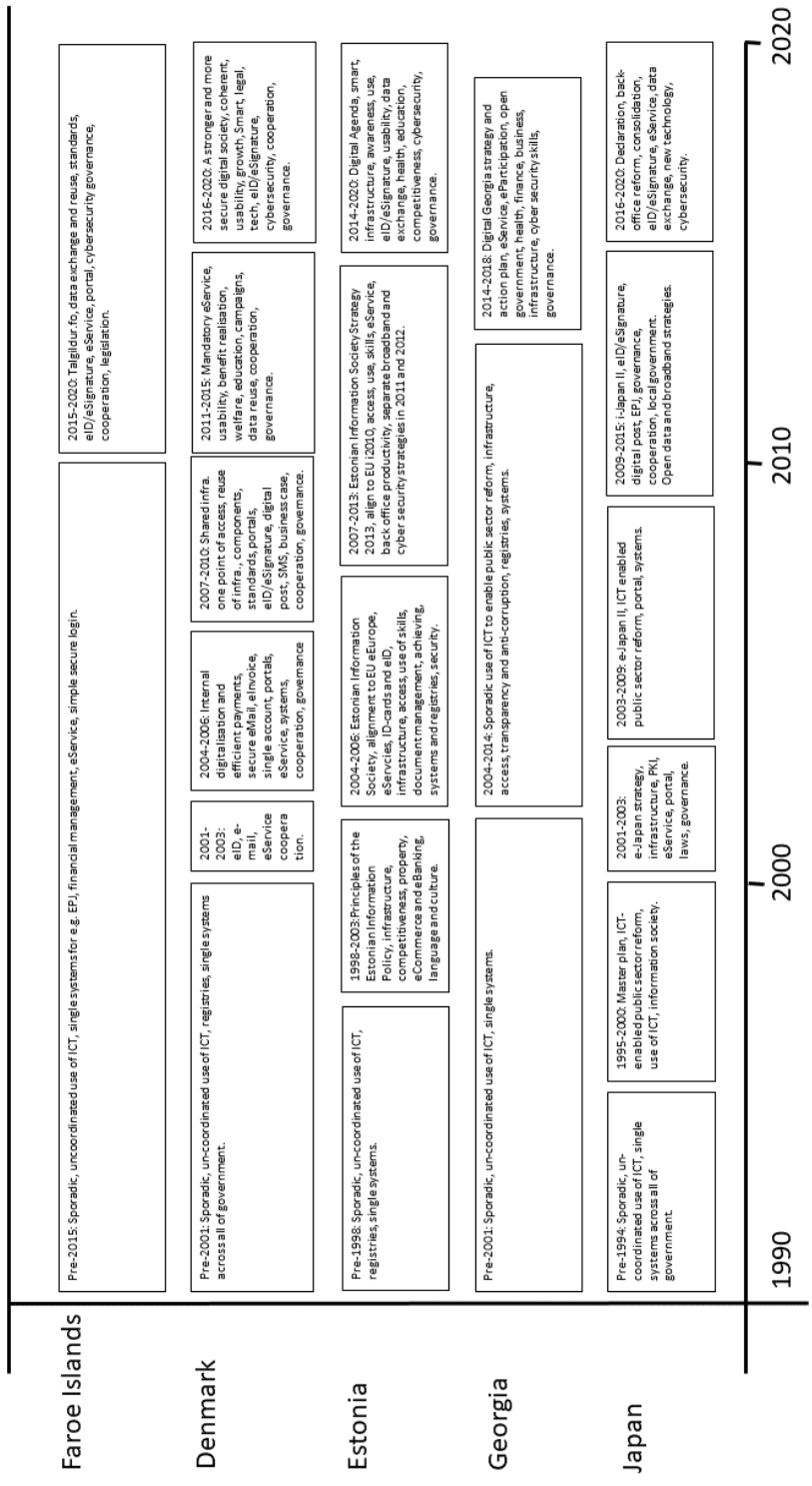


*Figure 8. National approaches to the use of ICT in government 1990–2020 (source: author, based on previous versions in **III, IV–VIII**)*

Secondly, this is followed by the emergence of eGovernment strategies formulating a general vision often focused on the roll-out of key infrastructures, such as fixed Internet access (and later also mobile), website and digital literacy. Thirdly, there is a realisation of the need for standards, legislative adjustments, transactional end-to-end eServices, portals, base registries, eIDs and digital signatures. Similarly, a need for consolidated and improved governance and intergovernmental coordination of horizontal and vertical integration emerges. Fourthly, an increased formalisation and deepening of governance and decision-making structures is observed. This includes coordination and cooperation models for ensuring horizontal and vertical integration. Overlaps and variation between the four general phases are observed in the five cases.

In terms of the general premise of the majority of eGovernment maturity models, as seen in section 3.2, the five cases certainly confirm the relevance of a number of elements. In terms of Lee's (2010) meta stages, this includes: presenting online information (i.e. websites); assimilating and replicating analogue processes online (i.e. transactional eServices). In all five cases, a degree of reform can be observed, that is, using technology for both front-end user interphases and back-office service production. Similarly, the increased use of unique identifiers for online identity management and digital signatures, use of data for public authorities' producing and delivering services, and platforms for delivering services (including websites, mobile apps and one-stop portals) match the reforming, morphing and occasionally the eGovernance meta stages and their characteristics (Lee, 2010; **II**, **III**, **VI**–**VIII**).

In short, the five countries' historic use of IT and technology does not reflect the precise sequential approach of the stage and maturity models. As proposed by maturity models, the uptake of ICT in government is initially sporadic, and online information provision is generally followed by transactional services in all five countries. Significantly, the five cases demonstrate that development of back office and front-end solutions occur in parallel as simultaneous processes (**III**, **VI**–**VIII**).

Blind digitisation of existing processes within existing organisational settings tends to dominate initial stages of ICT use in the five cases, particularly in first mover countries like Denmark and Japan (**III**). Late movers often follow a different trajectory, where single organisations and initiatives reflect a mix of Lee's five meta stages. Examples include an early focus on whole-of-government solutions and public-private partnerships in rolling out the infrastructure, development and use of IOP standards and models of data distributions and their reuse: eID and digital signatures in the Faroe Islands, Estonia, and Denmark (**III**, **VI**, **VII**). Estonia, and later Georgia and the Faroe Islands, are also examples of classical "leap-frogging", that is, learning from others and thus skipping stages of development or making the same mistakes (**VI**–**VIII**). The early realisation that governance mechanisms, cooperation, standards and legislative changes are required to facilitate an optimum use of technology once again highlights that ICT use by the public sector is not sequential but consists of a set of parallel processes.

In relation to the socio-economic context of each country, the case studies appear to indicate that relatively wealthy countries like Denmark and Japan have been early movers with respect to public-sector ICT use (**III**). That said, the Faroe Islands as a high-income country does not fully reflect this, potentially due to the relatively small population size (**VI**). The relative wealth does not seem to be the main driver of public-sector ICT use in the Estonian and Georgian cases, either (**VII**, **VIII**). Although research on the digital divide indicates that relative cost of Internet access (mobile or

fixed) is a key barrier to increasing usage (Meyerhoff Nielsen, Rohman and Lopes, 2018), the case studies are inconclusive for the role played by relative wealth. Ongoing research related to the UN EGDI nonetheless indicates that wealth is relevant (Martins et al., 2019). Correlating relative wealth with performance on the UN EGDI between 2013 and 2018 shows us that high-income countries generally outperform medium and low-income states and that GDP per capita by PPP is a factor. Similarly, small island states underperform in relation to their peers with similar levels of prosperity, unless they are in the high-income group of countries, indicating that size does matter unless a small island state is wealthy. Empirical findings also indicate that middle-income countries in particular may outperform high-income countries, and when they do, they seemingly had a strategic focus on rolling out telecom infrastructure and online service offers (Martins et al., 2019). The Faroese (**VII**) and the Danish (**III**) in particular illustrate the influence of cost-efficiency and productivity driving the digital transformation of the public sector, thus reflecting response patterns seen in the wake of financial crises in, e.g., Central and Eastern Europe (Raudla et al., 2015). Estonia (**VII**) and Georgia (**VIII**) have seen similar consolidation of financial and budgetary oversight in relation to external, mainly European, funding sources.

Approaches to ICT-enabled production and delivery of services in the five cases are in line with the proposed three-dimensional framework, particularly in relation to the non-sequential approach and importance of different proposed elements (**III**, **VI**–**VIII**). The learning curve is also relevant for the five countries, if authorities wish to actively facilitate and appropriately contextualise the digital transformation of the public sector (Janowski, 2015).

4.2 National approaches to preconditions, back-end and front-end elements

Exploring preconditions (i.e. dimension 1), such as Internet infrastructure and digital skills, the cross-country analysis finds that this has been and continues to be an early area of focus in all five countries. The evolution of both fixed and mobile infrastructures, increased demand for bandwidth and normal maintenance implies that broadband initiatives will continue to come into play over time. All five countries have focused on improving Internet infrastructure since the 1990s, and in particular in the 2000s, improving the geographical coverage, use, and affordability. Separate Internet broadband strategies and initiatives have been in play in all the countries. The Faroe Islands have been upgrading to a new generation 4G/LTE network since 2014, in the process becoming a national testing ground for Huawei's latest technological developments (**VI**). Denmark has targeted broadband speeds of 100 Mbps for downloading and 30 Mbps for uploading being available to all households and businesses by 2020 (EC, 2018a; **III**). Estonia aims to have a national minimum of 30 Mbps but with 100 Mbps for at least 60% of Internet subscribers by 2020 (EC, 2018b; **VII**). Georgia has similar targets, but with 100 Mbps for half the population (IDFI, 2015; **VIII**). Japan, which already has a superior Internet infrastructure, has an ambitious 1 Gbps target by 2020 (Takagi, 2016; **III**).

On the premise of a positive correlation between availability of technology and the population's use thereof, this focus seems logical (**I**), especially in light of empirical evidence. Applying a year-on-year Spearman non-parametric correlation test for twelve Baltic, Nordic, Central and Western European countries, a positive relationship between

the frequency of use and Internet access at home is found to exist (**I**). In fact, the Spearmen test persists year-on-year, and becomes statistically more significant over time as is illustrated by the changes between 2008 and 2014. Similar data samples highlight a close linear relationship between the frequency of Internet use and the uptake of services such as online banking. Whilst the Spearman test confirms the positive interrelationship between the frequency of Internet use and the propensity to use public-sector eServices, the relationship becomes weaker and statistically less significant over time, emphasising the limitations of current research – especially in relation to variables influencing successful take-up of online government service provisions.

Digital literacy was in focus in all five countries during the period analysed. Whilst incorporated in official eGovernment strategies in the 1990s, the increased uptake of the Internet and development of competences was later left to the formal education system, vocational and on-the-job training initiatives in non-eGovernment strategies. The focus has instead moved to the actual use of online service provision, as can be observed in the focus on digital-by-default and online usability initiatives witnessed in both Denmark and Estonia (**III**, **VII**) and to a lesser extent in Georgia and the Faroe Islands (**VI**, **VIII**). The development of digital skills, and the changing strategic focus identified in the case-work studies and the first two publications (**I**, **II**) is supported by the empirical analysis of how to bridge the digital divide for trends and the most influential factors when doing so. Using International Telecommunication Union (ITU) data for 208 countries and economies between 2010 and 2015, Meyerhoff Nielsen, Rohman and Lopes (2018) found that a direct causation existed between the variable tested, i.e. availability of the Internet, its use, the relative cost and levels of income. A deep-dive empirical analysis found that mobile infrastructure ensures better value and faster roll-out of physical access to Internet infrastructure. The relative cost of Internet access is a key challenge to bridging the digital divide between low-income and high-income countries, and in turn between low-income and high-income groups, and also rural and urban areas in low-income countries. By way of comparison, there is only a limited digital divide between low-income and high-income groups and rural and urban areas in high-income countries. Findings indicate that once roughly 50% of a population has physical access to the Internet, the actual uptake of Internet-based services reaches a tipping point and will increase automatically (Meyerhoff Nielsen, Rohman and Lopes, 2018). This supports technological acceptance models and the positive interrelationship between Internet access and actual use, no matter the personal level of income in high-income countries (Venkatesh and Davis, 2000; Legris, Ingham and Collerette, 2003).

In relation to back-end and front-end elements (also in relation to dimension 1) enabling public-service production and delivery, these are traditionally carried out in the front office and back offices of an organisation. Rooted in customer-contact theory, the front office has been described as “where the customers are”, whilst the back office is where processes not directly involving customers are carried out (Lynn Shostack, 1982). The customer-contact approach (Chase and Tansik, 1983) emphasises the disengagement of customer-contact activities from non-contact activities, in order to do justice to their varying design requirements and to maximise the efficiency of the service-delivery system through systematic standardisation. Consequently, service organisations consist of a front office and a back office, with technological applications being used with varying degrees in both parts of the organisation, but often utilising the

same systems depending on the channel strategy being applied to deliver services (Sampson and Froehle, 2009; Zomerdijk and de Vries, 2007).

National experiences and approaches (**III**, **VI**–**VIII**) confirm the importance of a number of elements present in maturity models, such as those found in Layne and Lee (2001). These elements nonetheless do not follow the assumed sequential processes on which the majority of maturity models are based. Rather than two sequential steps, back-end and front-end use of ICT are parallel processes, where online information and eServices are user interfaces linked to specific IT systems used by authorities for managing production and delivery of citizens' service requests (**I**, **II**, **IV**). Actual practice, therefore, has more in common with CMM and CMMI-inspired models proposed by Davison, Wagner and Ma (2005), NASCIO (2006), Iribarren et al. (2008) or Heeks (2005, 2015). These authors borrow heavily from IS management literature in single organisations, such as Laudon and Laudon (2011), or are related to electronic business (eBusiness) and commercial (eCommerce) research by the likes of Chaffey (2012) or Turban, McLean and Wetherbe (2001) (**I**, **II**, **IV**).

As seen in all five case studies (**III**, **VI**–**VIII**), public-service access and delivery traditionally consists of a mix of analogue or digital channels at multiple levels of government. Similarly, analogue channels include a mix of physical face-to-face contacts, telephone contacts, paper-based forms or postal mail (**III**, **VI**–**VIII**), with digital channels encompassing websites, online transactional services, mobile-based services and public access points such as kiosks (UNDESA, 2012; **III**, **VI**–**VIII**). As technology changes, new ICT tools are being applied and others are slowly phased out. Examples include websites and transactional online services replacing paper forms, AI permitting a new generation of call-centre applications (or call-centre robots and bots) or blockchain allowing for decentralised ledgers for certification, for example of identities or ownership of property (**III**, **VI**–**VIII**). The sequential distinction between front-end technological uses, as exemplified by websites, apps, eServices and portals, and back-end integration between systems is not reflected in the five country studies of this thesis and supports the parallel approach proposed in the three-dimensional framework (**III**, **VI**, **VIII**).

In all five countries, the initial websites and eServices were available by the early 2000s.

In the Faroe Islands, a strategic and coordinated focus started in 2015 with the first eGovernment strategy (**VI**). In Denmark, this had started during the strategy of 2007–2010 (**III**) and in Estonia as early as the second strategy during 2004–2006 (**VII**). In Georgia, the first eGovernment strategy from 2014–2018 emphasised an improved online presence (**VIII**), whilst this focus emerged in Japan with the second strategy in 2001–2003 (**III**). By way of comparison, a unified one-stop shop portal is currently still under consideration and development in the Faroe Island; however, the first unified portal was launched in Denmark during the 2001–2003 eGovernment strategy, in Estonia in 2004, in Georgia the national portal went live in 2014, and in Japan the 2003–2009 eGovernment strategy resulted in a national one-stop portal (**III**, **VI**–**VIII**). Again, the clear sequential approach assumed in eGovernment maturity models is not found in all five cases. A key example is that research such as the launch of eID and digital signatures is among the key enablers for successful online service provision for citizens. Emerging in the Faroe Islands in 2012 with a simple two-factor login (MinLykil/MyKey) linked to the unique national identifier for citizens, this lagged well behind the launch of the first transactional online services. A three-factor

authentication mobile ID is being developed for roll-out in early 2019 as part of the first eGovernment strategy (McBride, 2019) (**VI**). By comparison, Denmark launched its first eID and digital signature solution (NemID/EasyID) during the 2004–2006 strategy (**III**), with Estonia starting to focus seriously on electronic identity management during its second strategy in 2004–2006 (**VII**). Georgia launched its first eID and digital signature solution in 2011 and is still focussing on boosting take-up, including during the 2014–2018 eGovernment strategy (**VIII**). By contrast, Japan launched its first eID and signature (Mai Nambā/MyNumber) in 2016 after almost 20 years of discussions regarding unique identifiers and nearly two years of delays (**III**).

With regard to databases, strategies in Denmark and Japan started looking at back-end consolidation and reuse of data across authorities relatively late on. Whilst Denmark has had an Interoperability Framework since 2004, a strategic focus on reuse and once-only principles was only initiated with the 2011–2015 basic data programme. In Japan, the first open data strategy was launched in 2012, whilst discussions on a potential Interoperability Framework are still ongoing (Meyerhoff Nielsen, 2016; Meyerhoff Nielsen and Igari, 2012) (**III**). By way of contrast, the Faroe Islands, Estonia, and Georgia have focused on core registers, data quality, data exchange, and frameworks for their eGovernment strategies from the outset (**VI**–**VIII**). Estonia is a front-runner and global leader with its x-road concept launched in 2001 (**VII**). In Georgia, system connectivity and data exchange emerged as part of a public-sector agenda of reform, underpinned by ICT from 2004 (**VIII**).

4.3 National approaches to governance and intergovernmental cooperation

In relation to the introduction of new technology, governance, intergovernmental cooperation, responsibilities and stakeholders (i.e. dimension 2), there are different combinations in the five cases analysed. The five countries have followed a variety of strategic objectives, as outlined in section 4.1, at different times and in different phases. The five countries have also enjoyed different degrees of coordination across government levels and entities. Contextual differences often related to historic and cultural experiences and had been shaped by stakeholders and their relationships and interdependencies. The experiences of the five countries under analysis (**III**, **VI**–**VIII**) support the premise that the CMM and CMMI models may offer a more appropriate model for public-sector ICT use. In line with, e.g., the recommendations in OECD (2014), these case studies find that countries with a strong vision including whole-of-government strategies and action plans are more likely to succeed in their endeavours (**III**, **VI**–**VIII**). Likewise, the five cases support important elements for progress, including alignment of clear mandates and decision-making structures for strategic and operational issues, with monitoring and follow-up of strategic success criteria and KPIs (see Figure 9) also being highlighted by the OECD and individual member states, on whose experiences the OECD based its recommendations (Meyerhoff Nielsen and Yasouka, 2014; OECD, 2014; **III**, **VI**–**VIII**). This is also supported by recent research on approaches to customer-centric public service delivery in Latvia, Denmark and the United Kingdom (Ozols and Meyerhoff Nielsen, 2018), and on governance, intergovernmental cooperation and public-sector capacities in Australia, the Republic of Korea, Saudi Arabia, Seychelles, South Africa and Uganda (Meyerhoff Nielsen and Jordanoski, 2019; Meyerhoff Nielsen, Torres and Jordanoski, 2019).

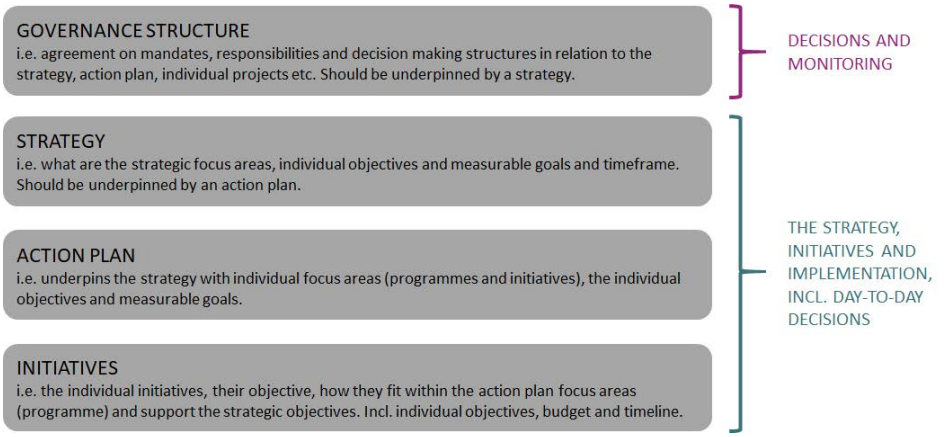


Figure 9. Critical governance elements (source: author)

Examples include the Faroese centralised cross-governmental financial management system (BLS), aimed at improved management of public finances following the financial crisis of the 1990s, and the digital healthcare system with its ongoing eGovernment strategy work. All are examples of a strong vision underpinned by political support, cross-governmental cooperation, and a strategic and implementation plan for individual initiatives (**VI**). A national example of this, is Denmark's continued focus on governance, intergovernmental cooperation, business cases and IT-projects and programme models, monitoring ex-ante and ex-post measurement (**III**). Post-Soviet Estonia has had a clear vision since the 1990s, with political support for a total rethink of the public sector and how to underpin it with technology (**VII**). A desire for coordination, collaboration and consensus facilitated this process in Estonia (**VII**), but also in the Faroe Islands and in Denmark (**III**, **VI**). For similar reasons, the post-Rose Revolution in Georgia largely succeeded in modernising the public sector, providing analogue and digital delivery of services. One outcome has been improved and faster access to services, with some arguing that this has led to a dramatic reduction in corruption related to public-sector delivery since 2004 (Engvall, 2012; TI, 2019). Georgia's Corruption Perception Index score and rank has improved from 136th to 41st between 2004 and 2018, and has ranked first or second in the Eastern European and Central Asian region since 2011 (TI, 2019). However, in subsequent years, a confused vision and reduced political support and coordination of public-sector ICT use in Georgia led to stagnation and limited progress (**VIII**). Similarly, the Estonian and Japanese cases indicate that where there had been limited strategic focus, progress was relatively slower than when addressed in strategic initiatives. In Estonia and Japan this can be detected in relation to using user-friendly language online, user-centric service design or a focus on channel strategies (**III**, **VII**). Thus, the five cases support the significance of both governance and inter-governmental cooperation, but also the need for standards, management capabilities, and involvement proposed by multiple models, whether inspired by IS management or CMM (**I**, **II**, **IV**).

Agreement on mandates, responsibilities and decision-making structures in relation to the eGovernment strategy, action plan, and individual projects continue to apply and remain highly relevant in most countries. As highlighted by, e.g., OECD (2014)

recommendations, past research (**I**, **II**) and the country studies in this thesis (**III**, **VI**–**VIII**), it is important for a given vision to set out the strategic areas of focus within a given strategy, including for citizen services enabled by ICT. The strategy focus area must include specific objectives, measurable and quantifiable goals, budgets, and a timeframe. The strategy should be underpinned by an action plan. Essentially each individual focus area should be broken down into specific programmes and initiatives with individual objectives and measurable goals. The objectives of individual initiatives must fall within the focus areas of action plans (or programmes) and support the strategic objectives. Together with their individual objectives, initiatives must have tailored budgets and timelines, no matter the level of government an initiative is targeting or is being implemented at (**II**–**VIII**).

In all five countries, the strategies analysed are underpinned with action plans, key strategic objectives and measurable success criteria. In relation to the uptake of online services, the Danish case stands out with its cross-governmental approach, making use of eServices mandatory and its links to a business case supported by operational data to ensure realisation of benefits (**III**). In terms of business cases and realisation of benefits, the Faroese are inspired by the Danish approach in particular, but also by Estonia's (**III**, **VI**, **VII**). It is unclear from the research to what extent this is the case in Georgia and Japan, as only sporadic evidence exists of monitoring and measurements (**III**, **VIII**). What is clear, is that only the Faroe Islands and Denmark have focused on all levels of government in their strategies and action plans, with Denmark documenting the realisation of benefits for the period 2012–2015 in the greatest detail (**III**, **VI**). The limited focus on local government can in part be explained by relatively limited human and financial resources in Estonian and Georgian municipalities (**VII**, **VIII**), although this could also argue in favour of increased strategic attention paid to municipalities. In the Japanese case, the high level of local government autonomy is given as a key explanatory factor, although similar levels of autonomy are also found in the Faroe Islands and Denmark (**III**, **VI**). With regard to service delivery, national country practices emphasise the need for monitoring at an operational level, across services areas, levels of government, service-delivery channels and time, as illustrated in Figure 10. This in turn supports the three-dimensional framework proposed.

As highlighted previously, national practice does not distinguish between front-end technological uses (e.g. websites, apps, eServices and portals), and back-end integration between systems. Both front-end and back-end uses of ICT are observed, but more importantly so are varying degrees of horizontal and vertical integration, with all five countries having focussed on back-office systems in combination with online service delivery, and having optimised efficiency and productivity using various forms of integration in cooperation with relevant stakeholders (**III**, **VI**–**VIII**). Again, the assumption of a sequential approach which eGovernment maturity models are based on is not clearly reflected in the national approach identified in all five cases. Rather, the national experiences observe individual initiatives with different combinations of focus on the front-end and back-end, different degrees of horizontal and vertical integration, and various levels of intergovernmental cooperation and partnerships (**III**, **VI**–**VIII**). For instance, the Faroe Islands integrate all levels of government in their electronic patient records and healthcare project, the public-private partnership approach to their eID, digital signatures, and data reuse initiatives (**VI**). Denmark and Estonia have similarly done this and been an inspiration to the Faroese (**III**, **VI**, **VII**). Georgia focused on shared service centres and registers, presenting a joined-up

government and user experience for citizens, but with back-office system integration or connectivity between different organisational silos (**VIII**).

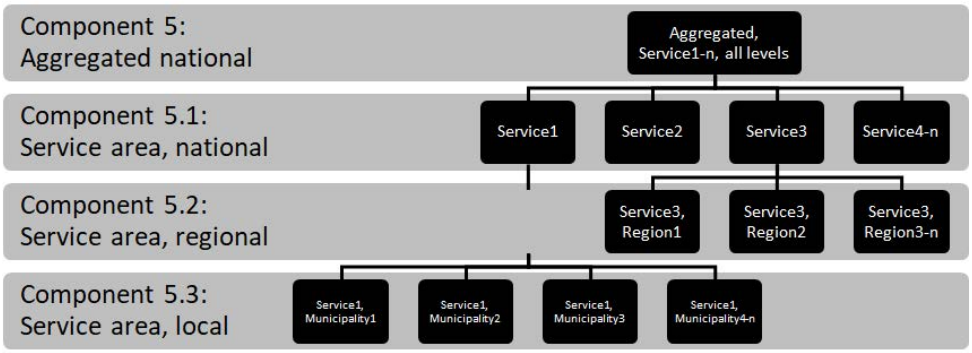


Figure 10. Public-service delivery measurements and aggregation across levels of government, hierarchical (source: author)

Looking at both formal and informal forms of intergovernmental cooperation, the national approaches and actual experiences vary, as summarised in Table 3 (**III**, **VI**–**VIII**). A formalised model of governance is in place in all five countries. Mandates and responsibilities are formalised in official organigrams with various degrees of involvement of public and private-sector stakeholders. All five countries involve key central government stakeholders in their steering committees. The process of developing eGovernment strategies (from idea and conception through to government approval) and action plans follows different trajectories in the five countries analysed here, but all take a centralised approach to coordination. In the Faroe Islands, the centralised process coordinates KT Landsin and the Ministry of Finance and consults relevant stakeholders (McBride, 2019) (**VI**). Denmark also uses a centralised approach, coordinated by the Danish Agency for Digitisation and in consultation with all relevant stakeholders including key ministries, Danish Regions and Local Government Denmark, private and civic interest groups (**III**). In Estonia, the Prime Minister's office, supported by the Ministry of Economic Affairs and Communication and the specialised Department of State Information Systems are responsible but consult key ministries and at times experts from the private sector and academia (**VII**). In Georgia, the eGovernance Unit of the cabinet office is responsible for coordination but is supported by the mandated Ministry of Justice and the specialised Data Exchange Agency (**VIII**). Similarly, Japan uses a centralised approach coordinated by IT Strategic Headquarters in the cabinet office and consults key ministries and larger IT and technology companies. That said, the Ministry of Internal Affairs and Communication and other powerful ministries responsible do not necessarily comply with IT Strategic Headquarters, and there is no consultation with prefecture, municipalities and other interests (**III**).

*Table 3. Stakeholders and cooperation (source: author, based on previous versions in **III, VI–VIII**)*

	Faroe Islands	Denmark	Estonia	Georgia	Japan
Mandated entity	Yes, Ministry of Finance	Yes, Ministry of Finance (Minister of Innovation)	Yes, Ministry of Economic Affairs	Yes, Ministry of Justice	Yes, Cabinet Office.
Responsible entity for overall development, implementation and coordination	Yes, specialised entity KT Landsin in Ministry of Finance	Yes, specialised entity Agency for Digitisation in Ministry of Finance	Yes, specialised Department of State Information Systems in Ministry of Economic Affairs and Communication	Yes, specialised entity DEA in Ministry of Justice	Yes, specialised IT Strategic Headquarters under the Cabinet Office but hosted by Ministry of Internal Affairs and Communication
National coordination	Yes, cross-governmental steering committee incl. central and local government	Yes, cross-governmental steering committee incl. central, regional and local government	Yes, steering committee incl. central government actors. Ad hoc expert group incl. local government	Yes, steering committee incl. central government actors and occasionally NGO and international experts	Yes, steering committee incl. central government, private sector and academia

In short, only the Faroe Islands and Denmark include representatives from all other levels of government. The Faroese and Japanese also actively consult representatives from the IT sector, with the latter also including academics. In both Denmark and Estonia academics and private-sector stakeholders are consulted but mainly through informal channels (**III**, **VII**). Georgia, in turn stands out for including non-governmental organisations like Transparency International and EU experts in some decision-making within the formal steering committee (**VIII**). Formally, only the Faroe Islands and Denmark take a truly whole-of-government approach to governance of eGovernment strategies and action plans – with the Faroe Islands drawing inspiration from both Denmark and Estonia (**III**, **VI**, **VII**). The five cases nonetheless highlight that informal collaboration is an important factor to ensure intergovernmental cooperation and consultation with non-governmental stakeholders both in academia and the private sector, and in civil society (**III**, **VI**–**VIII**). In particular, the Estonian (Kattel and Mergel, 2018; Cepilovs and Duenas-Cid, 2020) (**VII**) and Japanese cases (**III**) illustrate the positive impacts of personal contacts and informal networks, whereas the Georgian case shows the challenges faced if such contacts and networks are not underpinned by consensus-seeking and collaborative traditions and a degree of trust (**VIII**).

4.4 Legislation, standards and capabilities within government

As supported by the five national country cases, governance and intergovernmental cooperation is important, with evidence indicating a need for appropriate legislation, standards and management capabilities (i.e. dimension 3) (**III**, **VI**–**VIII**). Standards and management capacities are proposed by multiple models, especially those inspired by IS management and CMM (**I**, **II**, **IV**).

The use of legislation to ensure compliance with a given strategy and action plan is evident in all five case studies. All five countries align their eGovernment strategies to

other national strategies and make them part of their official government programmes, as seen in Table 4. With respect to the legal status of eGovernment action plans, this is the case in both the Faroe Islands and Denmark (**III**, **VI**), but it is only partially implemented in Estonia, Georgia and Japan (**III**, **VII**, **VIII**). With all countries funding key cross-governmental initiatives such as eID and digital signatures, most initiatives are financed by the entity responsible for implementation (**III**, **VI**–**VIII**). Key national differences exist, with regard to how to ensure and agree on decentralised funding. In the Faroe Islands and Denmark this is realised through annual budget negotiations for central, regional and local authorities and is overseen by the Ministry of Finance, which is also responsible for eGovernment (**III**, **VI**). A similar approach is followed in Estonia, but one key difference is how the use of EU Structural and Regional Funds is agreed upon: it is first decided in national budget negotiations and subsequently allocated for distribution by the Ministry of Economic Affairs and Communication and the specialised Department for Information Systems. In practice, projects, including those outside the eGovernment action plan, may then apply for the allocation of EU Structural and Regional Funds allocated to ICT initiatives. The allocation of central funds ensures a higher level of compliance by those initiatives as they are approved and monitored by mandated and specialised entities, but in practice cases of non-compliance do occur (**VII**). In both Georgia and Japan, limited progress and a lack of compliance can be detected as a result of the uncoordinated and limited legal status of the action plan. Lack of funding is often found to be an excuse given by authorities (**III**, **VIII**).

*Table 4. Legality of eGovernment strategies and action plans (source: author, adapted from previous version; **III, VI**–**VIII**)*

	Faroe Islands	Denmark	Estonia	Georgia	Japan
Action plan legally binding	Yes, indirectly as it is part of the government programme and agenda	Yes, is part of the government programme and annual budget negotiations between all levels of government.	Yes, is part of the government programme. Key initiatives are financed centrally but otherwise the responsibility implementing entities. The latter are often fraught and entities are not always in compliance with the action plan.	Yes, is part of the government programme. Financing is the Responsibility of Implementing Entities and often fraught. In practice entities are often not in compliance with the action plan.	No. Action plan is not legally binding and in practice implementing entities are not always in compliance.
eGovernment strategy legality	Yes, part of the government programme.	Yes, part of the government programme.	Yes, part of the government programme.	Yes, part of the government programme	Yes, part of the government programme.

Elements not addressed in any of the eGovernment maturity models are the mechanisms potentially influencing citizens' use of public-sector services online, including the existence of key legislation and standards relating to technology. This includes cyber security, privacy and data-protection legislation and standards which

help build trust in government uses of technology, handling data and online service provisions. The case analysis, as summarised in Table 5, finds that all but the Faroe Islands have introduced such standards and legal frameworks. In fact, both Denmark and Estonia are enacting the EU General Data Protection Regulation into law (**III**, **VII**). Estonia and Georgia rank in the top five globally for countries prepared for cyber security (**VII**, **VIII**), and all countries have data protection agency functions in place. The Faroese in turn are currently implementing some of the missing elements, in parallel to their first eGovernment strategy (**VI**).

In relation to interoperability, Denmark and Estonia have well-developed frameworks and standards. Denmark has sought standardisations since the 1990s and Estonia's x-road approach is one of the earliest distributed interoperability frameworks developed globally (**III**, **VII**). The Faroe Islands and Georgia in turn have relatively high levels of data exchange, but do not have national interoperability frameworks in place, although both are in the process of achieving this. Interestingly, both the Faroe Islands and Georgia are in part inspired by the Estonian x-road model but implement more centralised approaches for key systems, as is evident in the Danish centralised data-distribution infrastructure (**VI**, **VIII**). Japan is the only country analysed here which does not yet have a national interoperability framework and status. Data is exchanged in Japan, but the country is not yet moving towards the once-only principles already partially implemented in the other four countries undergoing analysis (**III**).

Elements such as user friendliness, relevance and awareness of services are important. Nonetheless, user behaviour over the last two decades indicates that citizens are either not aware of government websites and eServices, find them difficult to use, or simply have no motivation to use them. Incentives are different for the authorities. The potential benefits of ICT-enabled productivity gains and cost savings are key drivers, particularly in light of the 2008 financial crisis, increased labour costs, and aging populations. Therefore, governments have a vested interest in increasing the volume of online self-services. The case analysis, summarised in Table 5, shows that Denmark is the only country with both a digital-by-default approach and online usability standards for both websites and eServices at all levels of government (**III**). In fact, the case studies show that countries which take a proactive approach towards channel strategies and promoting these are likely to reap the rewards, as is clearly witnessed in Denmark and Estonia (**III**, **VIII**).

*Table 5. Selected standards, regulations and principles in place (source: author, adapted from previous version (**III, VI–VII**)*

	Faroe Islands	Denmark	Estonia	Georgia	Japan
Cyber security standard and Legislation	Partially, being implemented	Yes	Yes	Yes	Yes
Privacy standard and legislation	Partially	Yes	Yes	Yes	Yes
Interoperability standard	Partially, being implemented	Yes	Yes	Partially, being implemented	No
Once-only principle	Partially, but limited. Planned extension	Partially, with planned extension	Partially, with planned extension	Partially, but limited. Planned extension	No, but planned
Online usability standard	No, but planned	Yes	Partially, covers WCAG and other elements	Partially, covers WCAG and other elements	Partially, covers WCAG and other elements
Digital-by-default standard	No, but planned	Yes	Partially, for some service areas	No	No

Similarly, a whole-of-government and user-friendly approach towards service delivery online is also of benefit, as observed in Danish online service offerings and channel strategy, and the Georgian physical one-stop shops (i.e. public-service halls and community centres) (**III**, **VIII**). Where the approach to online service design, promotion and channel strategies is fragmented, as is the case with Georgian and Japanese online services, authorities struggle to increase the degree of digitisation and thus the return on their ICT investments (**I**, **III**, **VIII**). This indicates that the existence of supporting standards such as digital-by-default, online usability and whole-of-government approaches are potentially as important to online-service use as governance, intergovernmental cooperation and linking a national vision with a strategy, action plan, and measurable, quantifiable success criteria and key performance indicators (Heeks, 2005; Meyerhoff Nielsen and Yasouka, 2014) (**III**, **VI**–**VIII**).

4.5 Cross-country analysis in summary

In light of the findings of the metasynthesis analysis and the weaknesses identified in the maturity models (section 3.2) (**I**, **II**, **IV**), a disconnect emerges between existing eGovernment maturity models and actual reality. Despite more than half of all maturity models being based on national experiences and multi-country comparisons, these do not reflect or understand the delivery of public services. The majority of models propose dividing up front-end service requests and back-end processing into different stages. By way of contrast, economic rationale tends to prioritise back-office IT systems and automation to underpin all analogue and digital service delivery channels before providing services online. Similarly, it seems counter-intuitive to provide transactional services online, only to process service requests manually or without integrating the eService front-end interphase with the back-end IT system supporting delivery and production within the organisation (**I**, **II**, **IV**).

In relation to the overarching research questions, the individual cases and cross-case comparison reiterate a number of findings in the metasynthesis analysis. For one, current maturity models may provide governments with a simplified model for ensuring the supply of online services (SQ1), but the model has a number of inherent flaws. For one, public-sector service delivery and application of ICT in public administration is not fully understood for the greatest part, thus supporting past critiques with regard to the maturity model (SQ2) (Bannister, 2001; de Bri and Bannister, 2010; Traunmüller and Wimmer, 2003) (**I**, **IV**). With models generally offering a tool for monitoring and measuring online availability of certain types of information and transactional services (SQ3), this is limited to preconditions (i.e. dimension 1), such as availability of the Internet, skills and capabilities of end-users, and the availability of specific types of information, eServices, existence of key enablers such as eID and portal, reuse of data, etc. As was observed in the metasynthesis analysis, national and international benchmarks are examples supporting supply-orientated aspects of research questions in this thesis.

The case study findings support the metasynthesis analysis and lack of outputs and focus on outcomes (i.e. effect indicators in dimension 1). With proper data being difficult to access for the five countries, Denmark's measurements of online-service use during the 2012–2015 eGovernment strategy provides especially interesting insights. The same applies to data collected in Denmark, Estonia and Georgia, which all follow the approach and definitions of Eurostat (2017) (**III**, **VII**, **VIII**). While PA and IS management (Bannister and Connolly, 2011; Brown and Grant, 2005; de Bri and Bannister, 2015) have criticised eGovernment maturity models for not addressing outcomes, up until now they have not proposed practical approaches for doing so. As is evident from the metasynthesis analysis, the models attempting to tackle outcomes do not provide an actual or appropriate approach to ensure the monitoring and measuring of citizens' use of online services. Andersen and Henriksen's (2006) postulation is largely descriptive and positive in nature, while Klievink, Bharosa and Tan (2016) as well as Kim and Grant (2010) mix both descriptive, positive, and normative elements without actually addressing online service usage. The countries studied in this thesis, which clearly link their national vision with specific strategies, defined measurable success criteria and KPIs in their action plans and initiatives, and are found to achieve better outcomes, relatively (**III**, **VI**–**VIII**). This supports the recommendations made by the OECD (2014) and research by Heeks (2005), Andersen and Henriksen (2006), Obi (2016), and Meyerhoff Nielsen and Yasouka (2014).

The individual cases and cross-case comparison also unearth a number of interesting findings in relation to the role of governance, intergovernmental cooperation, and management capabilities (i.e. dimensions 2 and 3). The existence of clear mandates to ensure coordination, critical decision-making, and compliance are seen as factors facilitating progress and minimising the risk of failure. Positive effects are observed in all five cases (**III**, **VI**–**VIII**). When weakened or absent, stagnation and a decrease in progress are observed in Georgia and Japan (**III**, **VIII**). Governance and intergovernmental cooperation also emerge, including the need to link a national vision to strategies, action plans, measurable success criteria and performance indicators. Similarly, stakeholder collaboration and consultation (both formal and informal) are seen to influence progress and outcomes. These elements are seen to play a positive role in the Faroe Islands, Denmark, Estonia, and during the early days of Georgia's reform process (**III**, **VI**–**VIII**). However, their absence seems to make a successful

realisation of benefits more problematic in Georgia and Japan (**III**, **VIII**). These findings support previous criticism of the public sector's handling of ICT use by, e.g., Bannister (2001), de Bri and Bannister (2010), Lips (2012), and Traunmüller and Wimmer (2003). This adds support to the importance of governance, collaboration and capabilities seen in the CMM/CMMI-based models of Davison, Wagner and Ma (2005), NASCIO (2006), Iribarren et al. (2008) or Heeks (2005, 2015), but also the importance of Janowski's (2015) contextualisation of the digital transformation. Lastly, special agencies coordinating horizontal issues in relation to standards, legislation, key enablers, and core registers generally have a positive effect supporting some models (Iribarren et al., 2008; NASCIO, 2006; Obi, 2012) and past research and recommendations (OECD, 2014, 2016).

Based on the metasynthesis analysis of maturity models (**I**, **II**, **IV**), in section 3.2, the findings of the five country analyses are surprising. Especially as 22 (52%) out of the 42 models identified are found to be based on practical experiences and case studies (see Annex 2) (**II**, **IV**).

In relation to the conceptual framework and three-dimensional framework, proposed in section 3.3, the country studies broadly confirm the relevance of the proposed dimensions and elements, including the change from a sequential approach to one of parallels. The importance of flexibility to cater for different national contexts is also confirmed, as are priorities and the need to aggregate and disaggregate operational performance across levels of government, service areas, and service-delivery channels – although we must still determine whether the proposed three-dimensional framework can be populated in a meaningful way to monitor and measure changes in the use of online services.

5 Populating the three-dimensional framework

Having proposed a new approach and three-dimensional framework in section 3, and having compared both to national practices in five countries in section 4, how can progress and outcomes potentially be monitored and measured? Can a practical tool based on preconditions and effect indicators (i.e. dimension 1) be developed to complement the proposed theoretical framework?

First, for monitoring and measurement to be useful, these must be part of a larger project and operational eco-system. Essentially, any tool must be linked to a number of strategic objectives, which, in turn, are defined as measurable success criteria and key performance indicators (Heeks, 2005). Criteria and performance indicators, in turn, must be valid, relevant, and of value to decision makers. They must be internally subjective, i.e. based on individual judgements; internally objective, i.e. based on the quantification of goals within the organisation in question; or external, e.g. based on the quantification of goals outside the organisation, such as external audits and benchmarking. The measures in question must also provide insights on which management actions can control implementation and day-to-day operation, such as budgets, use of resources, timely implementation, operational performance, benefits realisation, returns on investment, etc. (Heeks, 2005; Meyerhoff Nielsen and Yasouka, 2014). The tool must be adaptable in order to provide a similar degree of flexibility, just like the three-dimensional analytical framework it complements.

5.1 Measuring use, benefits realisation, and outcomes

Internationally, two countries stand out in relation to a structured approach to monitoring and measurement of governments' online-service offerings. First, there is Denmark, with its Digital Scorecard used during the eGovernment Strategy 2012–2015 (DIGST, 2011, 2017a) (**III**), to ensure the transition to online service delivery and digital post. The Digital Scorecard was inspired by, and partly based on, data from the public-sector eService user platform operated by the citizen portal borger.dk between 2009 and 2017 (https://anvendelse.borger.dk), for providing municipalities with a tool to compare their own performance against others and against technical solutions from various vendors over time and by service area (Meyerhoff Nielsen and Yasouka, 2014; **III**). The United Kingdom's (UK) (not part of this thesis) gov.uk Performance Platform for central government authorities to monitor their performance is the other international first mover (GDS, 2018). Both the Danish and UK platforms monitor the use of online services as a percentage of overall service volume (i.e. degree of digitisation), for a given service area over time. All initiatives provide quantifiable, valid, valuable, and relevant performance and management information for the day-to-day operation of a given service delivery channel. This type of operational and strategic data enables the responsible authority to make knowledge-based decisions. The detailed and aggregated data enables Danish and UK authorities to actively monitor and measure the realisation of strategic objectives in their mandatory online self-service and digital-by-default eGovernment targets (DIGST, 2011; GDS, 2017; Ozols and Meyerhoff Nielsen, 2018).

A practical tool must relate to each of the proposed elements in order to be useful for monitoring, measuring and acting on actual user behaviour. In relation to preconditions and citizen service elements (i.e. dimension 1) proposed in the three-dimensional framework, illustrated in section 3.3's Figure 6, precondition components adopted from

past maturity models can be reused, including availability of the Internet. Two different approaches can be used for general and digital literacy (component 1). One is based on an aggregation of conventional and digital skills, as is evident in the UN eGovernment Development Index and the Human Development sub-Index (UNDESA, 2018b). Based on the premise that people who use the Internet for different activities also have the skills required to interact with government, eBanking or eCommerce usage can alternatively be used as an indirect measurement of digital literacy. Although this is not a perfect comparison, eBanking and eCommerce may act as a benchmark which online public-service provisions can be compared to in a given national context. It is proposed to use an aggregate of different technologies (e.g. fixed and mobile) for infrastructures (component 2), to ensure neutrality towards technology.

The Danish and UK approaches serve as inspirations (DIGST, 2011; GDS, 2017) for integrating parameters for output and effects. By utilising the degree of digitisation for a basket of service areas, the tool can provide an aggregated overview in a national or comparative international context. The basket may be weighted in relation to volume and frequency of use, but should generally consist of high-volume, high-frequency service regions. In this regard, it would be worth emulating the EU benchmarking services for citizens, as they apply almost universally (Lörincz et al., 2010).[6] The basket of service areas can be tailored to reflect a given national context. For instance, income tax can be included in countries where it is relevant and may be omitted in those where it is not. An added benefit of this approach is the ability to monitor individual service areas included in the predefined basket. In countries where service delivery is largely delegated to the regional or local level, individual service areas should be based on the aggregate degree of digitisation across regions and municipalities – or a representative sample of these – as illustrated in section 3.3's Figure 7. In practice, the basket of services should be based on predetermined weightings permitting the basket to function as a benchmark for change. The composition and weightings will depend on the purpose for measurement and monitoring, although this will not be covered by this thesis and the examples developed here. A country may not weight different services when comparing municipalities within single service areas but may wish to weight service areas according to relative service volume when calculating a nationally aggregated average. If used, this approach allows individual regions and municipalities to monitor their operational performance and to benchmark this against their domestic and international peers. For international comparisons, a similar approach can be used with a predefined basket of service areas, including core government services linked to life events, such as registering births, deaths, marriages, and vehicle registrations. eParticipation service types, such as consultation on legislation and policy proposals, may also be utilised.

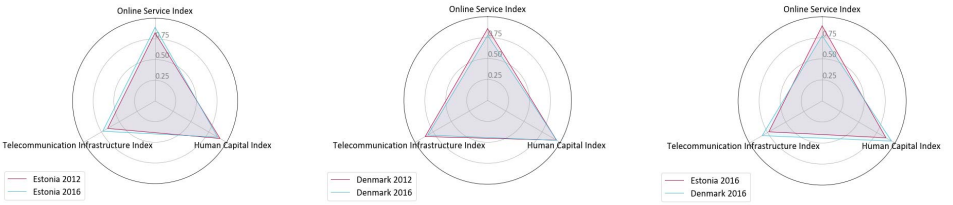
Although the degree of digitisation is proposed for the effect measurement, the model could incorporate all service-delivery channels, whether online, physical, by

[6] The EU 20 benchmark services consist of 12 high-frequency, high-volume citizen services and 8 business services. Citizen services include: income tax, enrolment in higher education, passport, driver's license, application for a building consent *(planning application)*, car registration, birth and marriage certificates, announcement of moving house, reimbursement of medical expenses, applications for student grants, health-related services, job search services, applying for unemployment benefits, applying for child allowance, declarations to the police, and public library services. Business services include: social welfare contributions for employees, corporate tax, VAT, customs declarations, permits relating to the environment, new company registrations, submitting statistical data, and public procurement (Lörincz et al., 2010).

telephone, or paper-based. This approach is flexible enough to allow the addition of a Likert scale qualitative parameter based on user ratings for individual services, service-delivery channels, or a combination of both. The flexibility may, if adopted, add value to both individual authorities and international benchmarks, like that of the UN, as illustrated above in Figure 5, and in terms of a more hierarchical representation in Figure 8.

A key challenge of the proposed three-dimensional framework is the unstructured approach to channel strategies and data collection across different channels. As witnessed in the five case studies, only Denmark had a structured approach during the period under analysis (**III**, **VI**–**VIII**). The EU benchmarking approach may therefore be a source of inspiration (EC, 2012, 2014) as a temporary or alternative measure. Eurostat information regarding DESI statistics provides annualised data on citizens' interaction with government, their use of government websites to search for information, and how many have downloaded a form or used a transactional service online. Data is collected for all EU member states and candidate countries (Eurostat, 2017). In fact, both the Faroe Islands and Georgia align their data collection to the Eurostat model and methodology (Hagstova Føroya, 2011; US Aid, 2017; **VI**; **VIII**). The Faroes are inspired by the Danish approach to business cases and benefit realisation, although it is not yet clear whether the current eGovernment strategy will have a positive financial return for the public sector (McBride, 2019), especially in light of the disproportionality of the per-capita investments required for this small island nation (**VIII**).

Inspired by the UN eGovernment Development Index and its three supply-orientated sub-indexes for the availability of infrastructures, human capabilities and online services, Figures 11, 12, 13 (UNDESA, 2012, 2018b; **III**, **VII**) show how the supply side (i.e. dimension 1) is currently measured by the eGovernment Development Index for Estonia and Denmark in 2012 and 2016.



Figures 11, 12, 13, UN eGovernment Development Index, scores and comparison of Estonia vs. Denmark, 2012 and 2016 (source: author, based on UNDESA (2012, 2016b))

5.2 Single country monitoring and measurements

Estonia is used as an example for illustrating how citizen service effects and output measurements may be added (i.e. dimension 1). Whereas the examples could be presented in a three-dimensional space, as the analytical framework is, it would be difficult to read in the two-dimensional medium of this thesis. The subsequent figures, therefore, use a spider-diagram like the UN eGovernment Development Index presented above. In Figure 14, use of the Internet infrastructure has been added (i.e. component 1), as have the additional indicators of citizens' digital skills level and attitudes to technology, represented by private sector eBanking and eCommerce

services usage (i.e. component 2). Citizens' interaction with government, their uptake and use of government websites and eServices (i.e. components 3 and 4) are also included.

Figure 14 uses Eurostat (2017) data for the DESI statistics for households and individuals.

It shows that 79% of Estonians accessed and used the Internet at least once per year in 2012. It also showed that 68% of Estonians had access to and the requisite skills to use private-sector service provisions online, such as eBanking. In the case of Estonia, the responsible authority for eGovernment, that is the Ministry of Economic Affairs and Communications and the specialist agency of the Department of State Information Systems (RISO), may subsequently make decisions based on this aggregated overview. For instance, only 54% of Estonians made use of the government's online-service provisions, despite 79% of them being online and 68% using private-sector equivalents. This indicates an untapped potential of between 14 and 25 percentage points for Estonian authorities to invest in websites, eServices, and associated back-end systems (**VIII**). The data also indicates that the vast majority of Estonians interacting with the government online were merely looking for information, rather than using the transactional eServices available (**VIII**). In short, Estonian authorities can improve the realisation of benefits incurred from investments by further promoting online interaction, and so mirroring the level of eBanking and Internet use. Another interesting fact highlighted here is the relatively low level of eCommerce in Estonia in 2012. This could prompt the government to launch programmes supporting private-sector uses of ICT to improve productivity and competitiveness.

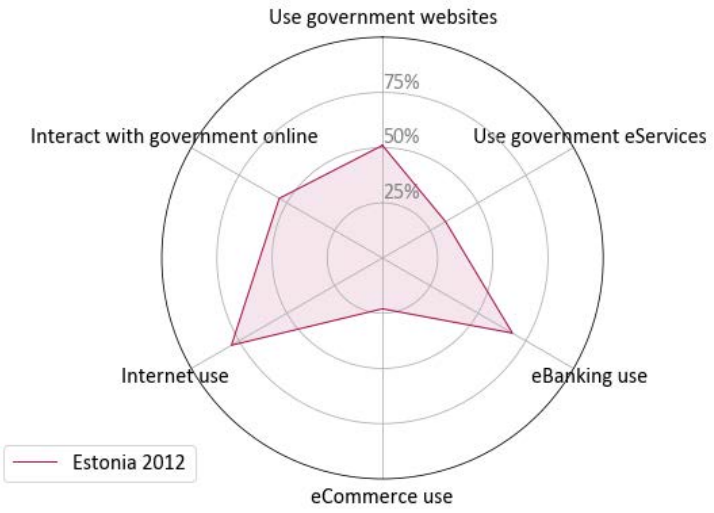


*Figure 14. Preconditions and aggregated citizen interactions with government online in Estonia for 2012 (source: author, based on Eurostat, 2017 and **VII**)*

Figure 15 compares the progress of Estonia between 2012 and 2016, in order to illustrate the potential of the tool for monitoring national performance over time. Using Eurostat (2017) data, Figure 15 shows that Internet use increased by 9% between 2012 and 2016, reaching 87%. It also indicates that private-sector service offerings online are

used increasingly, but that growth has been relatively higher in eCommerce, indicating that government programmes supporting private-sector use and adoption of ICT may have led to this result (JoinUP, 2016; **VII**). Similarly, online citizen interactions with the government improved by 23 percentage points, reaching 77% in 2016. In the case of Estonia, this illustrates the impact of eGovernment strategy and initiatives during the period, including promotion of government websites and eServices, which increased by 15 percentage points to 66% and by 35 percentage points to 68% during 2016, respectively. By narrowing the relative gap between Estonians using the Internet and those interacting with the government online, the data highlights two effects: first, that infrastructure has a better take-up and thus adds more relative value; second, that government investment in ICT solutions for public-sector service delivery is having a relatively higher return on investment due to the lower unit cost per service delivered online compared to analogue service-delivery channels (**VII**). In fact, combining the proposed approach with the average unit cost for each service-delivery channel (i.e. physical, paper-based, call-centre and online delivery channels) will allow calculations for a business case and monitoring its realisation over time (DIGST, 2017a; Meyerhoff Nielsen and Yasouka, 2014; **III**).

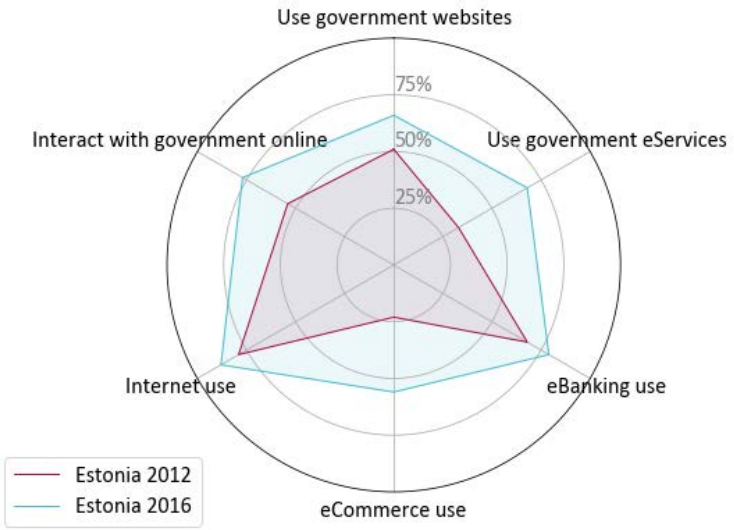


*Figure 15. An Estonian comparison 2012–2016 (source: author, based on Eurostat, 2017 and **VII**)*

5.3 Two-country comparison

Figure 16 is an aggregated comparison of Denmark and Estonia in 2016, in order to illustrate the potential of benchmarking the performance of two countries, whilst comparing them to the EU 28 Member State average. Using Eurostat (2017) DESI statistics for households and individuals, the relatively smaller percentage gap between Internet use and use of public-sector eServices indicates that Danish authorities and private-sector stakeholders may be relatively better at promoting eServices than their Estonian counterparts. In fact, the data indicates that Danish government websites are used by a higher proportion of citizens than those in Estonia.

As this interpretation is based on aggregated data, conclusions should naturally be qualified with evidence from additional sources, also as eGovernment strategies and action plans, for the same period in both countries. For instance, the relatively lower level of Estonians using government websites to search for information may be the result of the government integrating such information in eServices, pro-active information provision and service delivery, simpler regulations or a channel strategy promoting call centres. In the case of Denmark and Estonia, the two case studies show that Denmark had a strategic cross-governmental focus on online service delivery and communication during the period under analysis (**III**). Estonia focused on back-office systems, reusing data on a once-only principle, and has a tradition of simplifying processes, thus resulting in a simpler public-sector universe for Estonians to navigate compared to their Danish equivalents (**VII**).

In relation to international benchmarking, Figure 16 demonstrates that both Denmark and Estonia outperform their European peers when it comes to encouraging citizens to use of online government websites and eServices. By way of contrast, the relative success in providing Internet access and ensuring general use of infrastructures is substantially smaller both when comparing Denmark and Estonia, and in relation to their European counterparts (**III**, **VII**).

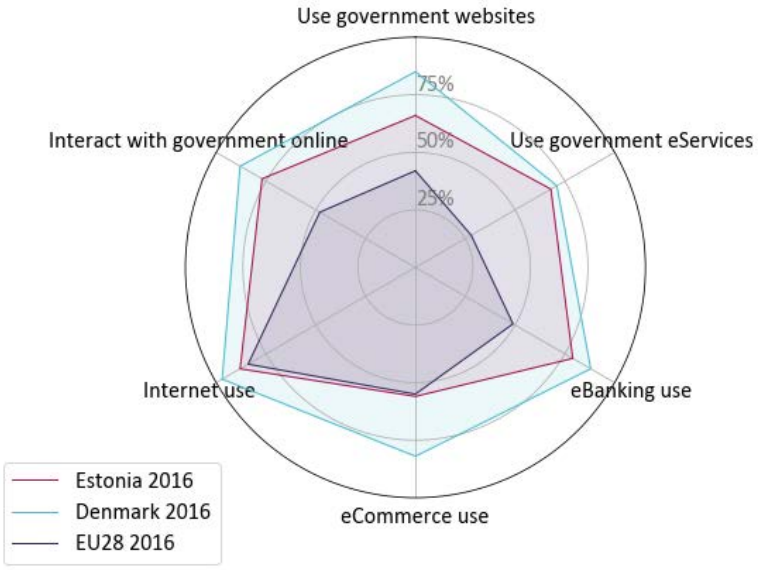


*Figure 16. A Danish-Estonian comparison in relation to the EU28 average, 2016 (source: author, based on Eurostat, 2017, and **III, VII**)*

5.4 Single-country data disaggregation

As proposed in the three-dimensional framework, Figure 17 expands on the previous examples by disaggregating eService use to compare a selected number of service areas with the aggregated average of citizens' engagement online with their government and respective use of online services in Denmark. Combining Eurostat (2017) Digital Economy and Society Statistics for households and individuals' data with performance data for selected service areas collected during the Danish case study (**III**), Figure 17

illustrates how individual authorities can compare their degree of digitisation, both with peers and in relation to a national average. For instance, use of the selected service areas are all higher than the aggregated average, indicating that the authorities responsible are comparatively better at promoting their online service offerings than the average Danish authority. It also shows that services, which were already mandatory for use in 2012, have seen no real change to their degree of digitisation, with online tax submissions being the primary example of this. Concerted efforts by the Danish authorities to promote online services in the period 2012–2016 and the subsequent results are of particular interest here. As part of the eGovernment Strategy, almost 70 high-frequency, high-volume areas were subjected to a strategic digital-by-default initiative, with 80% as the target value (**III**).

Although weighted averages are not used in the above examples, these illustrate the basic functions and flexibility of the proposed tool and how it may complement the precondition dimension (i.e. dimension 1) of the proposed analytical framework (section 3). The ability to use plug-and-play, to aggregate and disaggregate the different elements is useful if the tool should provide values for individual organisations, a given country, and also for international comparisons and benchmarks. In relation to benchmarking, the proposed tool does not focus on a ranking *per se*, but rather on the performance of, or across, service areas in a given organisation or at the public-administration level.

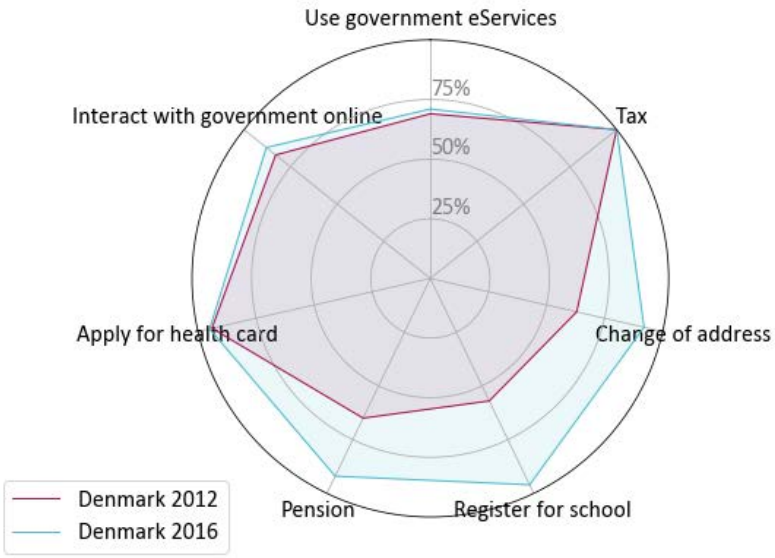


*Figure 17. Preconditions and aggregated citizen interactions with government online, including selected service areas in Denmark in 2012 (source: author, based on Eurostat, 2017 and **III**)*

5.5 Summarising the measurement of outcomes

Building on conclusions from past research regarding the importance of value creation and benefit realisation such as Andersen and Henriksen (2006), Bannister (2007) or Cordella and Bonina (2012) (**I**, **II**, **IV**), the metasynthesis in section 3.2 and the five-country comparative analysis in section 4 (**III**, **VI**–**VIII**), this section populates the new framework. The proposed three-dimensional framework reuses and realigns components from a number of eGovernment maturity models, in particular UN and EU benchmarks

(EC, 2014; UNDESA, 2016a), the theoretical outcome and value-focused models by Andersen and Henriksen (2006) and Kalampokis, Tambouris and Tarabanis (2011), CMM inspired and multi-dimensional models like NASCIO (2006), Iribarren et al. (2008), Heeks (2015), Dias and Gomes (2014), and context-specific approaches such as Janowski (2015).

The approach proposed for monitoring and measurement uses the same flexible plug-and-play approach as the three-dimensional framework proposed. This tool is based on the supply-orientated aspects of key elements in existing maturity models (EC, 2014; UNDESA, 2018a). By incorporating preconditions and effect indicators (i.e. dimension 1), the approach breaks with existing maturity models and addresses a host of past criticisms, including those by Andersen and Henriksen (2006), Bannister (2007), Cordella and Bonina (2012), Kim and Grant (2010) and Rorissa, Demissie and Pardo (2011) (**I**, **II**, **IV**). This approach is flexible enough to accommodate both aggregated and/or disaggregated elements, such as single service areas, delivery channels produced at different levels of government and for different users. It constitutes a practical tool for monitoring developments over time, across public and private channels, between different service areas, and it can even be disaggregated and used as a dashboard for comparisons between countries or regions. In a similar vein, this approach can be used to monitor different service-delivery channels, benefits realisation and user behaviour – if the relevant data is available. It also provides a tool for comparing similar countries across time and in aggregated and disaggregated form.

In relation to the three research questions, the key weaknesses identified in the metasynthesis and cross-country analysis are addressed successfully: firstly, using the adapted approach to ICT in public-sector service delivery; secondly, by incorporating effect and output indicators as proposed; thirdly, by proposing the new three-dimensional framework, which is independent of both services and technology, adaptable to different national, organisational and strategical contexts over time. The approach and framework provide a generic method for governments to both think about skills, infrastructure, and systems for producing back-end services across different channels before providing online-service offerings dependent on these preconditions for (SQ1) – and to prioritise them whenever or where necessary. In short, the proposed three-dimensional framework is successfully complemented with a monitoring tool populated with data collected in the case studies, thus addressing the lack of output and outcome orientation of eGovernment maturity models and many current government practices. It may be simple, but it provides a basic and flexible tool for authorities to apply in single organisations or across sectors and levels of government. It enables monitoring for user behaviour and progress in relation to aggregated strategy performance indicators. Performance, in turn, helps establish a model for emulation, on the basis of which decisions can be made and prioritised (SQ1), to better reflect the national practice identified in the five cases (SQ2); and is a way of monitoring and measuring the degree with which online service provisions supplied are used by citizens (SQ3), which in turn facilitates behavioural change and benefits realisation (SQ1, SQ3).

6 Conclusions and contributions to research

The main research question asked in this thesis is **how to improve the public sector's approach to the successful provision and citizens' actual use of online public services?** The question was raised in relation to the untapped potential of ICT for the public sector and its production of services and delivery of services to citizens, and faced at the onset of a new technology-led industrial revolution. The question was explored in relation to a core stream of research, especially the eGovernment maturity models which have emerged since 1999. As with any research, findings outside the original focus often come to light. This thesis is no exception and has, therefore, included not only contributions to other areas of research, but also future research questions.

6.1 The demise of eGovernment maturity models

In analysing **How to improve the public sector's approach to the successful provision and citizens' actual use of online public services (RQ)**, three research questions were developed in the context of this thesis. In this section, each research questions will be addressed in its own right.

SQ1: What frameworks have been suggested for providing value-adding online public-sector services to citizens?

This thesis identifies a full 42 eGovernment maturity models, but finds that only a handful focus on public-sector online services creating added value for citizens. Not all maturity models are normative or evaluatory by nature, with 18 (43%) found to mix positive and normative elements to some degree. Of these, eleven (26%) include some form of evaluatory elements or are used to assess performance – even if not formally intended as such by authors of maturity models. The most prominent example of this is the positive Layne and Lee (2010) maturity model, which forms the basis of international benchmarks such as the bi-annual UNDESA EGDI. This is particularly evident in relation to the roll-out of Internet infrastructure and the provision of information on government websites and online services. While 14.3% (i.e. 6 of 42) of all models include infrastructure and basic online service provision, only a minority can be argued as providing a theoretical or conceptual framework for governments to use. Maturity models addressing preconditions (EC, 2014; Iribarren et al., 2008; NASCIO, 2006; Obi, 2016; Shareef et al., 2011; UNDESA, 2016b) (**II**) and theorising on outcomes (Andersen and Henriksen, 2006; Kim and Grant, 2010; Klievink, Bharosa and Tan, 2016) (**II**) support this part of the research question. Although international benchmarks such as UNDESA (UNDESA, 2008, 2010, 2012, 2014, 2016a) and the EU (EC, 2012, 2014) have successfully promoted a certain strategic focus in relation to online service provisions, they do so without considering actual use and creating added value. eGovernment maturity models inspired by IS management (Iribarren et al., 2008; NASCIO, 2006; Persson and Goldkuhl, 2005) are more useful to governments, as they incorporate contextual and internal capacity factors relating to the successful use of ICT in a single organisation, although not in a complex multi-level public sector (**I**, **II**, **III**).

In the metasynthesis and the five-country analysis, the thesis detects some support for eGovernment maturity models acting as a model in the normative sense. By way of contrast, there is no evidence of maturity models providing a positive or heuristic model for ensuring value creation by public-sector investments for citizens' actual use of online public-service provisions (SQ1). Although international benchmarks from the

UN (i.e. UNDESA, 2001–2018) and the EU (i.e. EC, 2012–2019) appear to incorporate use, this is limited to the use of the Internet infrastructure, and not to the use of public-sector services provided online. Based on these findings, this thesis contributes to existing research by dissecting the sequential elements, complementing and realigning them in a parallel manner. In order to address this gap in the research, this thesis proposes and tests a realigned approach and a new, three-dimension framework. The different dimensions allow governments to both think about the skills, infrastructure, production of back-end and front-end services before providing online service offerings, depending on these preconditions for successfully providing online services, in order to ensure a minimal risk for citizens not using said services. The multi-dimensional plug-and-play approach may allow for further elements and dimensions to be added in the future, although this is a topic for future research.

SQ2: How do the identified frameworks correspond to country practices?

This thesis finds some evidence of eGovernment maturity models reflecting actual national practices in the five countries analysed. This is nevertheless limited to the existence of infrastructure, skills and competencies, certain websites and eServices, horizontal and vertical integration and thus indirectly inter-governmental cooperation.

Whilst 14% (i.e. 6 of 42) of all maturity models include infrastructure and basic online service provision, only a minority can be argued to provide a theoretical or conceptual framework for governments to use. Maturity models addressing preconditions (EC, 2014; Iribarren et al., 2008; NASCIO, 2006; Obi, 2016; Shareef et al., 2011; UNDESA, 2018b) (**II**) and theorising about outcomes (Andersen and Henriksen, 2006; Bannister, 2007; Cordella and Bonina, 2012; Kim and Grant, 2010; Rorissa, Demissie and Pardo, 2011) (**II**) support this specific research question. Whilst international benchmarks such as the UN (UNDESA, 2008, 2010, 2012, 2014, 2016, 2018a) and EU (EC, 2012, 2014) have successfully promoted a certain strategic focus in relation to online service offerings, they do so without considering actual use and value creation. eGovernment maturity models inspired by IS management (Iribarren et al., 2008; NASCIO, 2006; Persson and Goldkuhl, 2005) are more reflective governments, as they incorporate contextual and internal capacity factors relating to successful use of ICT in a single organisation, although not in a complex multi-level public sector (**I**, **II**, **III**).

To address the research gap, this thesis proposes a realignment of existing eGovernment maturity models. The new three-dimensional framework is compared to national practices analysed in five different countries and consists of parallel rather than sequential processes.

SQ3: How can the frameworks be revised to better include the country practices and academic findings?

This thesis finds some evidence of eGovernment maturity models providing governments with a practical tool for ensuring the supply of online services. Unfortunately, this is limited to the existence of infrastructures, skills, certain websites, and eServices forming part of international benchmarking. That being said, the thesis finds that none of the maturity models provides a practical tool for authorities to measure the degree to which citizens use said online services.

Whilst it is difficult to access effective data for the five countries, Denmark's measurements of online service used during the 2012–2015 eGovernment strategy provides particularly interesting insights as it measures both the use of online services

and quantifying this financially (**III**). Inspired by both theoretical models, international benchmarks and government practices, this thesis proposes and populates a basic but flexible tool with data for monitoring and measuring the degree with which online service provisions on offer are used by citizens. Restricted to the precondition dimension (i.e. dimension 1) of the proposed three-dimensional framework, the tool can be used within single service areas, organisations, or across government organisations and levels. This tool allows the authorities responsible to monitor strategic and operational performance across channels and service areas, to make informed decisions based on this information, and ensure benefits realisation. Thus, this tool helps monitor and measure the strategic shift during single initiatives or strategies. In practice, the tool also allows for merging classic benefits realisation, public-value creation, JUG and whole-of-government approaches to ICT-facilitated public-sector service production and delivery to citizens.

6.2 Future research

Whilst this thesis populated the proposed multi-dimensional analytical framework and tool with data, future research is proposed to further test the first and second dimensions, in particular with larger datasets and using a three-dimensional dashboard tool. Adding multiple delivery channels, output measurements of user satisfaction for analogue or digital services (e.g. Likert-scale user ratings) would also prove relevant. Similarly, open and big data elements could be tested, as could the frameworks' usefulness in, e.g., a large federal country where regional authorities are dominant.

As the third dimension – composed of legal, regulatory, standards, capabilities and resources – of the proposed three-dimensional framework is outside the scope of this thesis, it is an obvious area for further analysis and testing. Ideally, an in-case, cross-case comparison should be used to test and refine this dimension. This would help ensure comparability between this thesis and future findings.

The five case studies and stakeholder interviews (**III**, **VI**–**VIII**) unearthed a number of interesting factors and potential patterns in relation to governance and intergovernmental cooperation; these patterns lend support to recommendations made by organisations such as the OECD (2014) and researchers such as Heeks (2006) and Obi (2016). Using and complementing the case studies to analyse the role played by governance and intergovernmental cooperation in public-sector use of technology could consequently be the potential logical next step. In fact, such research could shed light on how governments can ensure a positive macro-level techno-economic paradigm shift (Perez, 2003, 2013) in practice, or may build on existing research on government approaches to cross-governmental transformation and innovation in countries such as Denmark and Estonia (Frambach and Schillewaert, 2002; Kalvet, 2012; Kattel and Mergel, 2018; Raus, 2009). The five case studies and cross-country comparisons (**III**, **VI**–**VIII**) may be developed further to provide some potential insight into the role *a strong governance model and high level of intergovernmental cooperation grants to the successful supply and use of online citizen services*, especially as the five cases seem to indicate that a *strong governance model leads to the provision and use of online services,* with Denmark and Estonia being positive examples (**III**, **VII**). The Georgian case supports this in two ways: initially, successful public-sector reforms were based on a clear vision and strong coordination; however, the limited progress in relation to eGovernment is partially due to a lack of vision, limited cooperation, and unsuccessful coordination (**VIII**). Japan, in turn, has been relatively less successful as a

result of limited inclusion of regional and local government stakeholders, together with a relatively weak mandate from the government CIO to ensure compliance with national strategies (**III**). The high-level of coordination and consultation in the Faroe Islands also adds support, but as a newcomer to the world of eGovernment strategies and eGovernance, outcomes from this country are still indicative (**VI**). This will be explored further by the author of this thesis.

In relation to PA literature review (**I**, **II**), the five cases analysed (**III**–**VI**) highlight the need and benefit of linking vision, strategy, action plans, and individual initiatives with KPIs, regular monitoring and follow-up research. This speaks in favour of value creation, monitoring and measurement elements found in the PA literature by, e.g., Cordella and Bonina (2012), Pollitt and Bouckaert (2011), Cordella (2007), and Self (2000). By so doing, Denmark achieved relatively better results in eService roll-out and use by citizens compared to Estonia, Georgia, and Japan, which have not done so (**III**, **VI**–**VIII**). Countries which took a whole-of-government/JUG approach to eGovernment development seemingly achieved better results in terms of uptake of key enablers, such as eID and digital signatures, back-end data reuse between authorities, and citizens' use of eService provisions, as observed in Denmark, Estonia, and the 2004–2014 reform strategy in Georgia, but not in Japan (**III**, **VI**–**VIII**). Similarly, collaborative JUG and partnerships with the private sector and civil society seem to achieve better results in terms of eID/eSignature take-up, as illustrated by the Faroe Islands, the Danish and Estonian cases. Georgia and Japan up until now have achieved lower user rates (**III**, **VI**–**VIII**). With the complexity of organisational change and all the political ramifications, the structured approach facilitated by intergovernmental collaboration and coordination in Denmark, Estonia and Georgia (in 2004–2014) (**III**, **VII**, **VIII**) supports recommendations by authors and organisations such as Bannister (2001), de Bri and Bannister (2010) and the OECD (2014), as well as drivers of change, collaboration and co-creation, emphasised by Lee and Kwak (2012), McBride et al. (2018), Pizzicannella (2010), as well as Schmidthuber et al. (2017). While this thesis uses a narrow definition of public service (McGregor, 1982), future research may find that the three-dimensional framework proposed may accommodate elements such as innovation and co-creation, which are often facilitated by intergovernmental collaboration and collaboration with end-users and stakeholders, as has been emphasised by authors such as Dawson and Robinson (1963), Berry and Berry (1990), as well as May and Jochim (2013). This may also be examined with regard to specific attitudes and the role of individual stakeholders (Berry and Berry, 1990; Ingold, 2011), the actual bargaining process (Lodge and Hood, 2012; Lowi, 1969) or the way that stakeholders interact, network and shape decisions in practice (Ostrom, 1971; Lewis-Beck, 1977; Arrow, 2002; Varda, 2009; Ingold, 2011).

Some evidence emerges in the five cases (**III**, **VI**–**VIII**) of more complex and dynamic non-technical and contextual aspects of public-administration reform, as is championed by authors such as Christensen and Lægreid (2007), Cordella and Bonina (2012), Lips (2012), Millard (2010), O'Leary, Gerard and Bingham (2006), as well as van der Broek et al. (2010). Examples include once-only initiatives and public-private partnerships for eID and digital signatures in the Faroe Islands, Denmark, and Estonia (**III**, **VI**, **VII**). Similarly, the whole-of-government and intergovernmental approaches to governance, portals, and shared service centres in the Faroe Islands, Denmark, Estonia and, to a lesser extent, in Georgia and Japan support this point (**III**, **VI**–**VIII**). These elements, in combination with the role that governance and intergovernmental cooperation plays

in successful application of ICT in public administration, will be explored by the author in future research.

IS management (**I**, **II**) and the capability maturity models show some promise. Should the CMM models be utilised in public administrations, the five cases (**III**, **VI**–**VIII**) indicate that they take cross-governmental and whole-of-government approaches into account rather than business processes for single organisations. Business-process re-engineering principles are relevant for whole-of-government and JUG approaches to public-service design and delivery (e.g. vertical and horizontal integration for user-centric, personalised, life-event, and proactive service delivery), but current CMM models (Dias and Gomes, 2014; Iribarren et al., 2008; NASCIO, 2006) and past research (Peters and Pierre, 1998; Röglinger, Pöppelbuß and Becker, 2012) generally do not account for cross-organisational cooperation and require further examination (**I**, **II**, **IV**), potentially lending support to Osborne, Radnor and Nasi's (2013) critique of NPM's pre-occupation with linear and Fordist models of public-service delivery, or digital-era governance as proposed by Dunleavy et al. (2006). This potentially provides an interesting and theoretically complementary element for the author's future research into governance and intergovernmental cooperation.

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Abstract

The Demise of eGovernment Maturity Models: Framework and Case Studies

This thesis explores **how to improve governments' approach to the successful provision and citizens' actual use of online public services.** The potential of the Information and Communication Technology (ICT) in the public sector is well-established. Many argue that the world is on the precipice of an ICT-led industrial revolution, but many actors are yet to reap the full potential of technology. Thus, this thesis's research question is raised in relation to the untapped potential of ICT for the public sector and its production of services and delivery of services to citizens, and faced at the onset of a new technology-led industrial revolution.

Methodology

Applying a three-phased approach, the thesis first reviews relevant streams of literature to identify a theoretical and conceptual model and a set of research gaps. A metasynthesis analysis of the 42 identified eGovernment maturity models is carried out, and a conceptual framework is developed. Second, Denmark, Estonia, the Faroe Islands, Georgia and Japan were chosen for classic, exploratory, qualitative, in-case country studies using the thesis's conceptual framework. Cases are based on desk research and 46 exploratory interviews (with 64 interviewees) and cross-case comparisons based on a refined conceptual model. Third, case-study findings are used to refine the conceptual framework leading to a new three-dimensional model. The new three-dimensional model is in turn populated with data from Denmark and Estonia (the only two countries with available data), to illustrate how the new model holds up to their actual experiences.

Findings

The review of the literature finds that classic public-administration (PA) literature, and particularly that on ICT-enabled public-administration reform, has a firm grasp of government and service delivery, stakeholders' dynamics and decision-making processes. In relation to ICT use, new public management and joint-up government are at odds with one another, leading to digital-era governance being proposed, although the latter does not combine measures for maturity and the use of online service offers. Information Systems (IS) management literature has proposed a number of information system management and capability maturity models. While these models address political and legal dimensions, most focus on business processes in single organisations. Unfortunately, most do not address the complex organisational set-up which dominates the multi-level, multi-organisational set-up characterising the public sector. There is also limited acknowledgement, even understanding, of the different nature of public-service delivery, to that of the private sector. The electronic-government and -governance (eGovernment and eGovernance) literature merge a number of public-administration and information management research streams. In relation to the research question, the so-called eGovernment stage and maturity models have emerged since the late 1990s as a specific stream of research within the eGovernment literature. Borrowing elements from information-systems management, eGovernment maturity models are generally simple, generic, sequential,

and technologically deterministic models. A clear link between supply and outcomes and between governance's role in the successful implementation and subsequent use of ICT and electronic services (eService) solutions is missing or at best unclear.

As a result of the review, the main research question of how to improve governments' approach to the successful provision and citizens' actual use of online public services is broken down into three sub-research questions, specifically: What approaches have been suggested for providing value-adding public-sector services to citizens online? How do the models identified reflect country-specific practices? How can country practices be reflected in the models identified?

A full 42 eGovernment maturity models are identified in the review of existing literature. The subsequent metasynthesis analysis finds that only a handful focus on public-sector online services creating added value for citizens. The models are generally technology- and supply-orientated with no focus on outcomes. There is often no real understanding of core government service, illustrated by many mixing up front-end service provision and back-office integration. Similarly decision-making is not necessarily a maturity level, but a service type (electronic democracy issue) and related to democratic processes. None of the models directly address governance, although integration is an aspect, with some looking at management and cooperation. Most models merely restructure or adjust existing ones. As approaches suggested for providing value-adding public-sector services to citizens online, not all models are normative or evaluatory by nature, with 18 (43%) mixing positive and normative elements to some degree. Of these, eleven (26%) include some evaluatory elements or are used to assess performance – even if not formally intended as such by authors of the respective maturity models. The most prominent example of this is the positive Layne and Lee (2010) maturity model, which forms the basis of international benchmarks such as the bi-annual UNDESA Electronic Government Development Index (EGDI). This is particularly evident in relation to the roll-out of Internet infrastructure and the provision of information on government websites and online services. While 14% (i.e. 6 of 42) of all models include infrastructure and basic online service provision, only a minority can be argued as providing a theoretical or conceptual framework for governments to use. Models addressing preconditions and theorising on outcomes support this part of the research question. Although international benchmarks such as UNDESA and the European Union (EU) have successfully promoted a certain strategic focus in relation to online service provisions, they do so without considering actual use and creating added value. Models inspired by IS management are more useful to governments, as they incorporate contextual and internal capacity factors relating to the successful use of ICT in a single organisation, although not in a complex multi-level public sector.

The metasynthesis and five-country analysis finds some support for eGovernment maturity models acting as a model in the normative sense. This is limited to the existence of infrastructure, skills and competencies, certain websites and eServices, horizontal and vertical integration and thus indirectly inter-governmental cooperation. By way of contrast, there is no evidence of maturity models providing a positive or heuristic model for ensuring value creation by public-sector investments for citizens' actual use of online public-service provisions.

To address the findings and the research gap, the thesis proposes a realignment of existing eGovernment maturity models. Sequential elements are dissected, complemented and realigned in a parallel manner. The new three-dimensional

framework is compared to national practices analysed in five different countries. The cases highlight that technology use is applied in parallel rather than sequential processes. As a result a new three-dimensional framework is proposed and then populated with data to test the new approach. The first dimension focus on preconditions such as skills, infrastructure, back-end service production and front-end service delivery. The second dimension covers stakeholders like authorities, politicians, businesses, citizens, interest groups, academics and experts. The third dimension on legislation, standards and capabilities includes that's as well as human and financial resources. The different dimensions allow governments to both think about the skills, infrastructure, production of back-end and front-end services before providing online service offerings, depending on these preconditions for successfully providing online services, in order to ensure a minimal risk for citizens not using said services. The multi-dimensional plug-and-play approach may allow for further elements and dimensions to be added in the future, although this is a topic for future research.

This thesis finds some evidence of eGovernment maturity models acting as a practical tool for government to ensure the supply of online services. Unfortunately, this is limited to the existence of infrastructures, skills, certain websites, and eServices forming part of international benchmarking. Regrettably, none of the maturity models provides a practical tool for authorities to measure the degree to which citizens use said online services. Whilst it is difficult to access effective data for the five countries studies, Denmark's measurements of online service used during the 2012–2015 eGovernment strategy provides particularly interesting insights. The same applies to data from Denmark, Estonia, and Georgia collected following the Eurostat approach and definitions. Inspired by theoretical models, international benchmarks and government practices, this thesis proposes and populates a basic but flexible tool with data for monitoring and measuring the degree with which online service provisions on offer are used by citizens. Restricted to the precondition dimension (i.e. dimension 1) of the proposed three-dimensional framework, the tool can be used within single service areas, organisations, or across government organisations and levels. The tool allows the authorities responsible to monitor strategic and operational performance across channels and service areas, to make informed decisions based on this information, and ensure benefits realisation. Thus, this tool helps monitor and measure the strategic shift during single initiative and strategies. The tool also allows for merging classic benefits realisation, public-value creation, JUG and whole-of-government approaches to ICT-facilitated public-sector service production and delivery to citizens.

Future research

Whilst this thesis populated the proposed multi-dimensional analytical framework and tool with data, future research is proposed to further test the first and second dimensions, in particular with larger datasets and using a three-dimensional dashboard tool. Adding multiple delivery channels, output measurements of user satisfaction for analogue or digital services (e.g. Likert-scale user ratings) would also prove relevant. Similarly, open and big data elements could be tested, as could the frameworks' usefulness in, e.g., a large federal country where regional authorities are dominant. As the third dimension (i.e. legal, regulatory, standards, capabilities and resources) of the proposed three-dimensional framework fell outside the scope of this thesis, it is an obvious area for further analysis and testing. Ideally, an in-case, cross-case comparison

should be used to test and refine this dimension. This would help ensure comparability between this thesis and future findings.

The five case studies unearthed a number of interesting factors and potential patterns in relation to governance and intergovernmental cooperation; these patterns lend support to recommendations made by international organisations and other researchers. Complementing the case studies to analyse the role played by governance and intergovernmental cooperation in public-sector use of technology could therefore be of interest.

Lühikokkuvõte

E-valitsemise küpsusmudelite ammendumine: raamistik ja juhtumianalüüsid

Info- ja kommunikatsioonitehnoloogia (IKT) märkimisväärset potentsiaali avaliku sektori kontekstis ei sea keegi kahtluse alla. Palju räägitakse sellest, et maailm on IKT-st tõukuva uue tööstusliku revolutsiooni lävel, kuid samas pole veel kaugeltki kõik tehnoloogia arenguga kaasnevatest hüvedest täiel määral kasu lõiganud. Käesolev doktoritöö uurib, **mida saaksid valitsused teha avalike e-teenuste paremaks osutamiseks nõnda, et kodanikud digiteenuseid ka tegelikkuses rohkem kasutaksid.** Töö uurimisküsimus keskendub IKT seni kasutamata potentsiaali rakendamisele avalikus sektoris, seda just teenuste loomisel ja kodanikele kättesaadavaks tegemisel olukorras, kus seisame silmitsi tehnoloogial põhineva uue tööstusrevolutsiooniga.

Metoodika
Doktoritöö läheneb uurimisteemale kolmes osas. Esmalt võetakse ette juba varem samal teemal ilmunud akadeemilised käsitlused, et kaardistada teoreetilised ja kontseptuaalsed mudelid ning tuvastada lüngad. Selleks tehakse kirjandusest leitud 42 e-valitsemise küpsusmudeli metasüntees ning luuakse kontseptuaalne raamistik. Teises osas rakendatakse saadud kontseptuaalset raamistikku klassikaliseks kvalitatiivseks riigipõhiseks juhtumianalüüsiks Taani, Eesti, Fääri saarte, Georgia ja Jaapani näitel. Juhtumianalüüsi käigus töötati riigipõhiselt läbi dokumene ja muid asjakohaseid materjale, lisaks tehti 46 ekspertintervjuud kokku 64 intervjueeritavaga. Juhtumianalüüsi võrdlev osa põhineb täiendatud kontseptuaalsel mudelil. Kolmandaks täiendati juhtumianalüüsi tulemustele tuginedes kontseptuaalset raamistikku, mille alusel loodi uus kolmemõõtmeline mudel. Viimaks rakendati saadud kolmemõõtmelist mudelit Taani ja Eesti andmete peal – vajalikud andmed olid olemas vaid neis kahes riigis – et näidata, kuivõrd on uus mudel kooskõlas tegelike kogemustega.

Tulemused
Klassikalistes avaliku halduse (AH) käsitlustes, eriti infotehnoloogial põhinevat avaliku halduse reformi puudutavates uurimustes, on põhjalikult vaadeldud nii valitsemist, teenuste osutamist, sidusrühmade suhteid kui ka otsustusprotsesse. Mis puudutab aga IKT kasutuselevõttu, siis ei käi uue avaliku halduse (*New Public Management*, NPM) vaade päris ühte jalga ühtse valitsuse lähenemisega: mõlemad peavad vajalikuks digivalitsemise tõhustamist, kuid viimane ei seosta omavahel küpsusmeetmeid ja osutatavaid e-teenuseid. Infosüsteemide juhtimist käsitlevates uurimistöödes on välja pakutud mitmeid infosüsteemide haldamise ja võimekuse küpsusmudeleid. Kuigi neis mudelites on arvestatud poliitiliste ja õiguslike aspektidega, keskenduvad need enamasti konkreetsete organisatsioonide äriprotsessidele. Paraku ei ole enamuses käsitlustes pööratud tähelepanu keerukale organisatsioonilisele struktuurile, mis iseloomustab avaliku sektori mitmetasandilist ja paljusid erinevaid asutusi hõlmavat toimimisloogikat. Samuti pälvivad vähe tähelepanu ja lahtimõtestamist avalike teenuste ja erasektori teenuste osutamise erinevused. E-valitsust ja e-valitsemist käsitlev kirjandus ühendab endas mitmed avaliku halduse ja infosüsteemide juhtimise uurimisvaldkonnad. Käesoleva töö uurimisküsimusega seoses võib märkida, et e-valitsemise tasemeid ja küpsusmudeleid käsitlevatest uuringutest on alates

1990ndate lõpust kujunenud e-valitsemise alases teaduskirjanduses omaette uurimissuund. E-valitsemise küpsusmudelid on laenanud mitmeid elemente infosüsteemide juhtimisese valdkonnast: need mudelid on reeglina lihtsad, üldkohaldatavad, astmelised ja kantud tehnoloogilisest determinismist. Puudub otsene seos digiteenuste pakkumise ja tulemuste vahel ehk teisisõnu on valitsuse roll tehnoloogiliste lahenduste ja e-teenuste edukal rakendamisel ja nende järgneval reaalsel kasutamisel ebaselge.

Olemasolevate uurimuste analüüsile tuginedes sai väitekirja keskne uurimisküsimus – kuidas valitsused saaksid parandada oma lähenemist, et pakkuda paremaid avalikke digiteenuseid ja tõsta seeläbi nende tegelikku kasutamist – jagatud kolmeks alaküsimuseks. Esiteks, milliseid lähenemisi pakutakse välja, et osutada kodanikele lisaväärtust loovaid avalikke e-teenuseid? Teiseks, kuidas tuvastatud mudelid peegeldavad konkreetsete riikide seniseid kogemusi? Kolmandaks, kuidas saaks riikide kogemusi kirjeldada läbi olemasolevate mudelite?

Uurimustest leiti koguni 42 erinevat e-valitsemise küpsusmudelit. Metasünteesist nähtus, et vaid käputäis neist keskendub kodanike jaoks lisaväärtust loovatele avaliku sektori e-teenustele. Mudelite fookuses on olnud eelkõige tehnoloogia ja pakkumine, mitte aga väljund ja tulemus. Tihti jääb vajaka arusaamisest, mis on riigi tuumteenus, näiteks aetakse alatasa segi otsene teenuste pakkumine (*front-end*) ja teenuste toimimiseks ja integreerimiseks vajalike protsesside haldamine (*back-office*). Samuti ei väljenda otsuse langetamise võimalus tingimata küpsusastet, vaid teenuse tüüpi (elektrooniline demokraatia) ning on seotud demokraatliku valitsemisprotsessiga. Ükski mudelitest ei vaatle otseselt valitsemist, kuigi arvestatakse integreeritust, teatud juhtudel ka juhtimist ning koostööd. Enamik mudeleid lihtsalt kohandavad või teevad ümber juba olemasolevaid mudeleid. Mudelid, mis peaksid aitama tõhustada avalikke digiteenuseid ja looma seeläbi tavakodaniku jaoks suuremat lisaväärtust, ei pruugi olla oma olemuselt normatiivsed või hindavad: 18 mudelit (43%) ühendavad endas mingil määral nii positivistlikke kui ka normatiivseid elemente. Nendest mudelitest 11 (26%) sisaldavad mõnda hindamiselementi või on kasutatavad toimimise hindamiseks – isegi kui küpsusmudelite autorid seda nii ei kavandanud. Kõige ilmekamaks näiteks on siin Layne'i ja Lee (2010) positivistlik küpsusmudel, mis on aluseks rahvusvahelistele võrdlusnäitajatele, sealhulgas iga kahe aasta tagant avaldatavale ÜRO majandus- ja sotsiaalameti (UNDESA) e-valitsuse arengu indeksile (EGDI). See on eriti selgelt märgatav internetitaristu ülesehituses ja info esitamises riigi veebisaitidel ja veebiteenustes. Kuigi 14% mudelitest (ehk 42 mudelist 6) sisaldavad taristu ja põhiliste veebiteenuste pakkumise komponenti, võib ainult väheste puhul öelda, et need annavad valitsustele kasutamisvalmis teoreetilise või kontseptuaalse raamistiku. Mudelid, mis käsitlevad eeltingimusi ja arutlevad võimalike tulemuste üle, toetavadki uurimisküsimuse seda osa. Kuigi rahvusvahelised võrdlusnäitajad, mille on koostanud UNDESA ja Euroopa Liit (EL), on aidanud hästi hoida e-teenuste arendamise strateegilist fookust, ei võeta nende puhul arvesse teenuste tegelikku kasutamist ja loodavat lisaväärtust. Infosüsteemide juhtimise loogikat järgivad mudelid on valitsustele kasulikumad, kuna võtavad arvesse organisatsiooni tegevuskeskkonda ja sisemisi IT-halduse protsesse ühe organisatsiooni kontekstis, samas arvestamata mitmetasandilise avaliku sektori keerukusega.

Doktoritöö osana tehtud metasüntees ja viie riigi analüüs annavad teatava aluse e-valitsuse küpsusmudelite kasutamiseks normatiivse lähtekohana. Siiski piirdutakse siin taristu, oskuste ja kompetentsi, teatud veebisaitide ja e-teenuste ning horisontaalse

ja vertikaalse integratsiooni ehk kaudselt ka valitsusasutuste vahelise koostöö aspektidega. Teisalt pole mingeid tõendeid, mis kinnitaks, et küpsusmudeleid saaks võtta kui positivistlikke või heuristilisi mudeleid, mis tagaksid avaliku sektori investeeringute abil uue väärtuse loomist, et kindlustada tavakodanike suurem aktiivsus riigi eteenuste kasutamisel.

Saadud tulemustest johtuvalt ja uurimislünga täitmise eesmärgil soovitab käesolev väitekiri olemasolevad e-valitsemise küpsusmudelid ümbervaadata. Mudelite järjestikused osad võeti analüüsi käigus lahti, neid täiendati ning paigutati ümber nii, et need oleksid paralleelsed. Uut kolmemõõtmelist raamistikku testiti võrdluses viie erineva riigi kogemustega. Nagu selgub, rakendatakse praktikas tehnoloogiat pigem paralleelsete, mitte astmeliste protsessidena. Sellest tulenevalt pakutakse töös välja uus kolmemõõtmeline raamistik ja testitakse selle paikapidavust viie riigi andmete baasil.

Mudeli esimene dimensioon hõlmab eeltingimusi nagu oskused, taristu, toimivad keskkontori protsessid ja kodanikule pakutavad teenused. Teine dimensioon hõlmab erinevaid osapooli, nende seas riigiasutused, poliitikud, erasektor, tavakodanikud, erinevad huvirühmad, teadlased ja eksperdid. Kolmas dimensioon katab aga õigusruumi, standardeid, haldussuutlikkust ning inim- ja rahalisi ressursse. Mudeli kolmedimensiooniline analüüs võimaldaks valitsustel enne e-teenuste käikulaskmist mõelda läbi asjakohased oskused, taristu, pakutavad teenused ja neid tagavad protsessid. Võttes arvesse digiteenuste edukaks pakkumiseks vajalikud eeltingimused, tagatakse, et risk teenuste mittekasutamiseks on minimaalne.

Seda mitmevaatelist hõlpsalt rakendatavat nn *plug-and-play* loogikal toimivat mudelit võib tulevikus vastavalt vajadusele lisaelementide ja -dimensioonidega täiendada, kuigi see eeldaks täiendavaid uurimistöid.

Selle doktoritöö raames leiab mõningast kinnitust, et e-valitsemise küpsusmudelid võiksid olla valitsustele praktiliseks abivahendiks toimivate digiteenuste pakkumisel. Paraku piirdub see eeskätt taristu, oskuste, konkreetsete veebilehtede ja e-teenustega, mis on osa rahvusvahelisest võrdlusanalüüsist. Kahjuks ei aita ükski küpsusmudel riikidel hinnata seda, kuivõrd tavakodanikud digiteenuseid reaalsuses kasutavad. Kuigi uuringus kasutatud viie riigi andmete kättesaamine ei ole lihtne, võimaldab Taani digiteenuste kasutatavuse statistika, mida kasutati sealse e-valitsemise strateegia 2012–2015 raames, erakordselt huvitavaid järeldusi teha. Sama võib öelda ka Taani, Eesti ja Georgia andmete kohta, mida koguti vastavalt Eurostati metoodikale ja definitsioonidele.

Võttes aluseks nii teoreetilised mudelid, rahvusvahelised võrdlusnäitajad kui ka riikide kogemused, on käesoleva doktoritöö tulemusena valminud lihtne kuid paindlik andmepõhine tööriist, mis võimaldab jälgida ja mõõta, kui palju tavakodanikud avalikke digiteenuseid reaalselt kasutavad. Eeldusel, et esimese dimensiooni eeldused on täidetud, saab seda kolmedimensioonilist mudelit kasutada tööriistana erinevates avaliku sektori kontekstides vastavalt soovile kas siis ühe teenusvaldkonna või organisatsiooni lõikes või ka paljude ametiasutuste koosvaates ja erinevate tasandite lõikes. See metoodika võimaldab vastutavatel asutustel jälgida strateegilist ja funktsionaalset tulemuslikkust teenuse kanalite ja –valdkondade kaupa, langetada selle info põhjal läbimõeldud otsuseid ning tagada, et inimesed saaksid hüvesid kasutada. Seega aitab väljatöötatud mudel jälgida ja mõõta strateegilisi muutusi iga konkreetse algatuse ja strateegia kontekstis. Tegu on tööriistaga, mis võimaldab ühendada klassikalise avalike hüvede võimaldamise, kodanike jaoks väärtuse loomise, ühtse ja

tervikliku valitsemise läbi tehnoloogiapõhiste kodanikele suunatud avalike teenuste loomise ja reaalse kasutuselevõtu.

Edasised uurimissuunad

Kuigi käesoleva doktoritöö raames väljatöötatud mitmemõõtmelist analüütilist raamistikku ja abivahendit on juba reaalsete andmetega testitud, oleks edaspidise uurimistöö käigus hea esimest ja teist mõõdet täiendavalt testida, seda just suuremate andmekogudega, kasutades kolmemõõtmelist visualiseerimist võimaldavat töölauda. Asjakohane oleks ka erinevate e-teenuse kanalite ning kasutajate analoog- ja digiteenustega rahulolu mõõdikute lisamine (nt Likerti skaalal). Samuti võiks testida ka ava- ja suurandmeid ning regulatsioonide kasutegurit näiteks nagu see võiks toimida suures föderaalriigis, kus domineerivad regionaalsed omavalitsused. Kuigi väljatöötatud metodoloogia kolmas dimensioon, mis hõlmab õiguslikke ja regulatiivsed aspekte ning standardeid, haldussuutlikkust ja ressursse, ei olnud osa käesolevast uurimistööst, oleks hea ka neid valdkondi analüüsida ja testida. Ideaaljuhul võiks selle mõõtme testimiseks ja täiustamiseks kasutada juhtumianalüüsi ja ka juhtumite vahelist võrdlust, mis aitaks tagada võrreldavuse ka tulevaste uuringutega.

Käesoleva uurimistöö fookuses olnud viis juhtumianalüüsi tõid päevavalgele valitsemise ja riigisisese koostöö mitmetahulise dünaamika koos rea huvitavate aspektide ja võimalike seaduspärasustega. On tähelepanuväärne, et ilmnenud seaduspärasused langevad kokku soovitustega, mida on varasemalt teinud rahvusvahelised organisatsioonid ja teised autorid. Seega võiksid pakkuda huvi ka täiendavad juhtumiuuringud ning nende analüüs, et saada suuremat selgust, milline roll on valitsemisel ja riigisisesel koostööl tehnoloogia rakendamise tulemuslikkuse tagamisel avalikus sektoris.

Appendix 1 eGovernment maturity models in Lee's metasynthesis framework

The table below contains a summarised overview of the identified eGovernment maturity models. Models are mapped in accordance with Lee's qualitative metasynthesis framework (Lee, 2010) as adapted by the author to include pre-conditions (source: author, **II**).

Name / author of model	Year of publication	# of stages in the model	Research approach (deductive, inductive, abductive)	Purpose and usage (descriptive, normative, positive, evaluatory)	Pre-conditions (0)	Presence (1+2+3 / Lee presence)	Transaction (4+5 / Lee assimilation, transaction)	Reforming / Transformation (6+7+8 / Lee reforming)	Matching / Personalisation (9 / Lee connection)	eDemocracy (10 / Lee eGovernance)	Ranking / benchmarking / index evaluation	
ANAO (Australian National Audit Office)	1999	4	A/D	N/E		2+3	4+5	6+7				CLUSTER 1
Deloitte Research	2000	6	D	N/P/E		2+3	4+5	7+8				
Gartner Group	2000	4	D	N/P/E		2+3	4+5	6+7+8	9			
SAFAD (Swe Agency for Admin. Dev. / Statskontoret)	2000	4	A/D	D/N/P		2+3	4+5	6+7+8				
Hiller & Belanger	2001	5	I	D/P		2+3	4+5	6+7+8		10		
Howard	2001	3	I	D/P		2+3	4					
Leyne & Lee	2001	4	A	D/N/E		2	4+5	6+7+8				
Silcock	2001	6	I	D		2	4+5	6+7+8	9			
United Nations	2001-	4	A	D/N/P/E	0	2+3	4+5	6+7+8		(10)	x	
Wescott	2001	6	A	D/N/P		1+2+3	4+5	6+7+8		10		
Chandler & Emanuel	2002	4	I	D/P		2+3	4	7+8				
EU	2002		A/D	N/P/E	(0)	2+3	4+5	6		(10)	x	
Hodginson	2002	5	I	D/P	(0)	1+2+3	4+5		9			
Moon	2002	5	A	D/P		2+3	4+5	6+7+8		10		
Netchaeva	2002	5	I	D/N		2+3	4+5	6+7+8		10		
UKNAO (UK National Audit Office)	2002	5	A/D	N/P/E		2+3	4	6+7+8				
World Bank	2002	3	I	D/N/P		2+3	4+5	6				
Accenture	2003	5	D	N/E		2	4+5	6+7	9		x	
Koh & Prybutok	2003	3	I	D/P		2+3	4+5+6	7+8				
Reddick	2004	2	A	D		2+3	4+5	6				
Waseda	2004-		A/D	D/N/P/E	0		4	7+8		10	x	
West	2004	4	A/D	D/N/P/E		2	4+5	6+7+8		10	x	
Windley	2004	4	D	D/N/P		2+3	4+5	6+7+8	9			

Name / author of model	Year of publication	# of stages in the model	Research approach (deductive, inductive, abductive)	Purpose and usage (descriptive, normative, positive, evaluatory)	Pre-conditions (0)	Presenting (1+2+3 / Lee presenting)	Transaction (4+5 / Lee assimilation, transaction)	Reforming /User-centric (6+7+8 / Lee Reforming)	Morphing / Personal (9 / Lee Morphing)	eDemocracy (10 / Lee eGovernance)	Ranking/ benchmark/ index/ evaluation	
Davison et. al.	2005	4	I	D/P		1+2+3	4+5	6+7+8				CLUSTER 2
Siau & Long	2005	5	I	D/P		2+3	4+5	6	9	10		
Persson & Goldkuhl	2005	2	I	D/N		1+2+3	4+5	6+7+8	9	10		
Andersen & Henriksen	2006	4	A/D	D/P		(1)+2+3	4+5	6+7+8	9	(10)		
NASCIO	2006	6	D/I	N/P/E	0	1+2+3	4+5	6+7+8	9	10		
Cisco	2007	3	A	D/N		3	4	7+8	9			
Almazan & Gil-Garcia	2008	6	A	D/N/P/E		1+2+3	4+5	6+7+8		10	x	
Chan et. al.	2008	5	A	D/P		2+3	4+5	6+7+8	9			
Iribarren et. al.	2008	4	D/I	D/P					9			
Shahkooh et al	2008	5	A	D/P/N		2+3	4+5	6+7+8		10		
Klievink & Janssen	2009	5	I	D/P/N				6+7+8	9			
Kim & Grant	2010	5	I	D/P/N/E		2+3	4	6+7+8	9	(10)		
Kalambokis et. al.	2011	4	I	D/P		1+2		7+8	9	10		
Shareef et. al.	2011	5	I	D/P	0	1+2	3+4+5					
Alhomod et al	2012	4	A	D/P		2+3	4	8				
Lee & Kwak	2012	5	A	D/P		2+3			(9)	10		
Dias & Gomes	2014	12 / 3	I	D/N/P/E		1+2+3	4+5			(10)	x	
Heeks	2015	7 / 2	I	D/P		2+3	4+5	6+7+8	9			
Janowski	2015	4	I	D/P		1+2+3	4+5	6+7+8	9	10		

Appendix 2 eGovernment maturity models based on empirical research

The table below contains a summarised overview of eGovernment maturity models based on empirical research, that is practical experiences and case studies (**II**).

Model	Type	Experiences/case study
ANAO	National	Australian experience.
SAFAD	National	Swedish experience and ANAO model.
UKNAO	National	United Kingdom experiences.
NASCIO	National	United States of America, States.
Iribarren et al.	National	Chilean experience, plus experiences of 22 countries. Annual ranking of Australia, Canada, Republic of Korea, Sweden, United Kingdom, USA, and others.
Accenture	Consultant	Observations in 22 countries. Annual ranking of Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Malaysia, Mexico, the Netherlands, Norway, Portugal, Singapore, South Africa, Spain, the United Kingdom, and USA.
UN	International	Observations in 193 countries since 2008.
EU	International	Observations in 28 EU plus associated member states. Based on the SAFAD model. Annual ranking of the countries.
Layne and Lee	Scientific	Observations in the US.
Moon	Scientific	Case study of 2,000 US municipalities.
Reddick	Scientific	Observations in US municipalities.
Wescott	Scientific	Observations in Asian-Pacific countries.
Waseda	International	Observations in multiple countries.
West	Scientific	Case studies of 1,813 and 1,680 municipalities in the USA, in 2000 and 2001, plus observations in multiple countries in 2006.
Windley	Scientific	Case study of Utah.gov in the USA.
Andersen and Henriksen	Scientific	Case study of 110 Danish stage sites and Layne and Lee model.
Shareef et al.	Scientific	Case study in Canada.
Chan, Lau and Pan	Scientific	Case study of selected Chinese regional portals.
Almazan et al.	Scientific	Case study of 32 Mexican state portals.
Dias and Gomes	Scientific	Case studies of 239 Portuguese municipalities in 1999, 2007, 2010, and 2013.
Lee and Kwak	Scientific	Observations in the health sector in the USA.
Janowski	Scientific	Observations in multiple developing countries.

Appendix 3 Publications (Articles I–VIII)

Article I

Meyerhoff Nielsen, M. (2016). E-governance and stage models: analysis of identified models and selected Eurasian experiences in digitising citizen service delivery. In: J. Wai, ed., *Electronic Government*, vol. 13(4). pp. 107–141. doi: 10.1504/EG.2016.076132 (ETIS 1.1).

E-governance and stage models: analysis of identified models and selected Eurasian experiences in digitising citizen service delivery

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Abstract: Despite 60 years of use, challenges in relation to information communication technology (ICT) in public administration prevail. Statistics in 18 Eurasian countries show a linear relationship between internet access and frequency of use, and between internet use and the propensity to use private sector services such as online banking, but that this does not automatically translate to public sector e-services use. The literature review, subsequently identify and evaluate 30 e-government stage models to see if they offer a solution or explanation to the lack of e-service take-up. The paper identifies three gaps in current e-government research: Which variables positively effects e-service use and whether this correlations be statistically proven; the degree with which governance and cooperation models ensure successful supply and use of e-services, and; existing stage models for mapping e-government progress only address supply-side, technology and organisational issues. The paper concludes by outlining a proposal to address the identified research gaps.

Keywords: e-government; information technology; IT; ICT; information communication technology; Governance, cooperation, stage and maturity models; e-services for citizens; service delivery; supply; demand; Eurasia.

Reference to this paper should be made as follows: Meyerhoff Nielsen, M. (2016) 'E-governance and stage models: analysis of identified models and selected Eurasian experiences in digitising citizen service delivery', *Electronic Government, An International Journal*, Vol. 12, No. 2, pp.107–141.

Biographical notes: Morten Meyerhoff Nielsen is a Researcher at the Tallinn University of Technology, Ragnar Nurkse School of Innovation and Governance and an expert at Democratise. He is a recognised expert on e-government with a speciality in: e-governance; performance management and tools; citizen portal functionality and architecture; User-friendly and personalised e-services; e-participation; e-voting; Web2.0; Gov2.0; Open Data and Interoperability. He is a Guest Lecturer at the Maastricht School of Management and European Institute of Public Administration. Past employment incl.: Danish Agency for Digitisation, National IT- and Telecom Agency; Danish Technological Institute; European Institute of Public Administration; Centre for the Development of Enterprise; European Commission; and University of KwaZulu-Natal.

This paper is a revised and expanded version of a paper entitled 'Identifying eGovernment success factors: An analysis of selected national governance models and their experiences in digitising service delivery' presented at *EGOSE 2014 Conference on Electronic Governance and Open Society: Challenges in Eurasia*, St. Petersburg, Russia, 18–20 November, 2014.

1 Introduction

The aim of this paper is two-fold: First, to determine the current state of affairs of internet access, frequency of use and whether this has translated into the use of online banking and public sector services (e-services); Secondly, with a focus on the so-called stage and maturity models for progress in electronic government (e-government) to assess if they address the role played by governance and cooperation in the successful implementation and citizen use of public sector online service offers.

Section 2 of the paper outlines the rational and focuses of e-government research to date thus providing the backdrop to the papers focus. Section 3 outlines the methodology use, including the geographical coverage, key data and literature sources and the analytical approach. Section 4 present the statistical findings and current status of household internet penetration, frequency of internet, online banking and government service use are presented and analysed. Section 5 describe, map and evaluate the identified e-government stage models. Section 6 concludes the paper by summarising the findings and how to proceed with any identified research gaps.

2 Background

As governments are facing complex challenges, they are expected to be innovative in their resource utilisation and how they organise service delivery. Information communication technology (ICT) is seen as a change agent to meet these challenges. Either by increasing efficiency, effectiveness, transparency, accountability and/or inclusiveness (UNDESA, 2014).

ICT use in public administration and service delivery has long been the focus of research, international benchmarking and case studies. Research related to IT and technology use in public administration has progressed, and consequently the focus has shifted over time. Researchers such as Bannister (2007), Bannister and Connolly (2011), Brown and Grant (2005), Heeks (2005), Heeks and Bailur (2007), Scholl (2005, 2009) and Yildiz (2007) and ongoing research by Jukić et al. (2015), illustrate the changing focus of academic discourse. Initially, the focus was on measuring and evaluating the maturity of ICT in public administration (from 1999 to 2000), followed by analyses of preconditions and contextual issues (e.g., awareness, digital divide, trust and infrastructure, etc.). The focus then shifted to the evaluation of the availability of e-government services (i.e., supply, maturity level, etc.). Subsequently, the research focus has moved to the actual use of e-government solutions (i.e., demand, usage, the gap between interest and use, the influences affecting use, etc.) and the evaluation of e-government impacts (i.e., effectiveness, efficiency, equity, etc.). Of late, the innovative use of ICT in 'SMART' cities and decision-making (e.g., e-participation and

e-democracy) and the role of governance models and the level of cooperation and integration between public authorities to ensure the successful implementation of national strategies for e-government (i.e., e-governance) has been in vogue.

As a term 'electronic government' was first coined in 1993 by the US National Performance Review, while the term 'e-government' became prominent around 1997 (Heeks and Bailur, 2007). ICT has never-the-less played a role in public sector service delivery since the middle of the 20th century. While Howard Gammon, in his 1954 review paper on the automatic handling of paper work, does not use the term 'electronic government' specifically, he does focus on the use of ICT in the public sector (Gammon, 1954). While computing and digitisation was in its infancy – a mere 40 computers and semi-automated punch-card machines existed in the USA in 1954 (Bevir, 2012) – Gammon's analysis uses the common definition of e-government as coined in 1997.

For the purpose of this paper e-government is defined as "the use of ICT and its application by government for the provision of information and public services to the people" (UNDESA, 2014). This definition stands in contrast to electronic governance (e-governance), which encompass all processes of governing, whether undertaken by a government, market or network, whether over a family, tribe, formal or informal organisation or territory and whether through laws, norms, power or language (UNDESA, 2014).

For the purpose of this paper, the focus on e-government, 'governance' and 'cooperation', i.e., the concrete activity that reproduce formal or informal organisations. In other words, governance refers to what the 'governing bodies' responsible for e-government do to ensure success.

3 Methodology

3.1 Geographical coverage

This paper looks at 18 Eurasian countries in six geographical groups. The groups and countries are (NB: country abbreviations are used in the graphical presentation of data):

- Baltic, i.e., Estonia (EE), Latvia (LV) and Lithuania (LT)
- Caucasus, i.e., Armenia (AM), Azerbaijan (AZ), Georgia (GE)
- Central Europe, i.e., Austria (AT), Czech Republic (CZ) and Slovenia (SI)
- Eastern Europe, i.e., Belarus (BY), Russia (RU), Ukraine (UA)
- Nordic, i.e., Denmark (DK), Finland (FI) and Sweden (SE)
- Western Europe, i.e., The Netherlands (NL), Belgium (BE) and United Kingdom (UK).

Of the 18 countries, 12 are members of the European Union (EU), three are members of the Eurasian Economic Union (EAEU) and nine were part of the former Soviet Union.

The countries represent a mix of centralised and federal administrative structures, population size and levels of gross domestic product.

The statistical average for the 28 European Union member states is included when data are presented and acts as an indirect benchmark.

3.2 Statistical sources and approach

Three main sources of data are used: Eurostat information society household survey; United Nations (UN) eGovernment Readiness Index, in particular the Telecommunication Infrastructure Index (TII), in combination with the International Telecommunication Union's (ITU) key telecommunication/ICT indicators.

All data are presented as a percentage of all individuals (i.e., whole population), whether online or not.

For comparability and validity Eurostat statistical data are sourced for the period 2008–2014. For visualisation and ease of use, date is presented for the years 2008, 2012 and 2014.

3.2.1 Eurostat information society household survey

Eurostat collects data on EU member states and some associated countries, including the Baltic, Nordic Central and Western Europe countries in this paper. Data analysed for the purpose of this paper includes:

- *Individuals*: Frequency of internet use [isoc_ci_ifp_fu], Frequency of internet access: once a week (including every day).
- *Broadband and connectivity*: Individuals [isoc_bde15b_i], internet access at home.
- E-banking and e-commerce [isoc_bde15cbc].
- Individuals using the internet for interacting with public authorities [isoc_bde15ei] including:
  - *internet use*: interaction with public authorities (last 12 months)
  - *internet use*: obtaining information from public authorities websites (last 12 months)
  - *internet use*: downloading official forms (last 12 months)
  - *internet use*: sending filled forms (last 12 months).

3.2.2 UN and ITU key ICT indicators

For non-EU member states, i.e., Eastern Europe and Caucasus countries included in this paper, the two main data sources are the UN TII data and the ITU key ICT indicators. Data are unfortunately not available for all the Eurostat indicators, neither in the same detail nor with the same frequency. Data analysed for the purpose of this paper is therefore limited to:

- percentage of individuals using the internet
- percentage of households with internet access.

3.3 Analytical approach

This paper uses a qualitative approach. First, the paper looks at the development in internet use and activity levels to determine any inter-relationships between the

household access to the internet, frequency of internet use, online banking and government service use (Section 4). The aim is to identify any patters in the user of internet and the take-up (or lack of) public sector service offers online. As the datasets is relatively small (i.e., the number of countries analysed) and consist of mainly dependent variables traditional *f*-test and *t*-fit are not appropriate. Similarly, an initial analysis of the data show that the data distribution is not normal, so the application of parametrical statistical method is not ideal as there are potentially too many variables in the individual countries in play. Thus, a Spearman correlation test is run year-on-year to identify any relevant relationships between the different variables.

The paper continues by looking at existing stage models with the purpose of identifying an appropriate scientific framework for the paper (Section 5). The stage models will be identified and assessed by reviewing exiting literature. The literature review has been carried out following a classical pattern for systematic information retrieval as outlined by, e.g., Roberts (1977) and the Walsh and Downe (2005) qualitative meta-synthesis procedure. The seven-step Walsh and Downe model has been adapted to include 'berry picking' (Bates, 1989). For this purpose existing literature has been reviewed using key word searches (i.e., 'e-government' and 'stage' or 'model', or 'level', or 'tier' or 'development') in Web of Science (Thomsom Reuters, 2015), Scopus (Elsevier, 2015) and EGRL – E-Government Reference Library (version 10.5) (University of Washington, 2015) plus Research Gate and Google Scholar.

Using the adapted Walsh and Downe model, qualitative key word and meta-synthesis analysis (see Section 3.3) is used to identify the definitions of the individual stages in the identified models. The aim is to map the various models and their respective stages to create an overview of the meta states.

As the models are based on different perspectives and use different definition and metaphors, they can be difficult to understand and summarise. To alleviate this difficulty, the identified meta stages is distilled further using Lee's qualitative meta-synthesis framework (Lee, 2010). Using a detailed qualitative meta-synthesis procedure Lee use 12 stage-models to develop a new semantic framework consisting of five general metaphors, namely Presenting, Assimilating, Reforming, Morphing and E-governance. The Lee's five metaphors are defined in Table 1.

Lastly, the paper draw on the actual experiences in the countries chose, to determine whether there exist a relationship between the supply and subsequent levels of citizen e-service and the national governance and cooperation model.

4 E-service supply and demand side issues

To date most countries, including the 18 Eurasian countries covered in this paper, have focused on the introduction of e-services. This focus unfortunately neglects the actual demand and use of online services.

In the context of this paper, take-up and use refers to the action of taking up or making use of available e-services (UNDESA, 2008). Thus, the actual use of supplied online services is of paramount importance, as it is the tangible benefits of digital services can only be realised through the actual and effective use of supplied e-services by citizens (Meyerhoff Nielsen, 2011; UNDESA, 2014).

Table 1 Metaphors: their definitions, related stages, and themes

		Stages/concept	
Metaphors'	*Descriptions*	*Citizen and services*	*Operation and technology*
Presenting	Presenting information in the information space	Information	
Assimilation	Assimilates (or replicates) processes and service in the information space with the ones in the real world	Interaction	Integration
Reforming	Reform the processes and services in the real world to match the information space requirements, fitting for efficiency	Transaction	Streamlining
Morphing	Change the shape and scope of processes and services in the information space as well as the ones in the real world, fitting for effectiveness	Participation	Transforming
E-governance	Processes and services in both worlds are synchronously managed, reflecting citizen-involved changes with reconfigurable processes and services	Involvement	Process management

Source: Lee (2010)

4.1 Data issues

As exemplified by the methodology of the UN eGovernment Readiness Index (UNDESA, 2014) and European Commission eGovernment Benchmark since 2010 (EC, 2012), e-government largely focus on the supply side, i.e., the development and rollout of ICT infrastructure, IT solutions and e-services. That this focus has served national governments well is supported by data for a select number of years (in this paper 2008, 2012 and 2014) and sample of Eurasian countries (i.e., Armenia, Azerbaijan, Georgia, Estonia, Latvia, Lithuania, Austria, Czech Republic, Slovenia, Belarus, Russia, Georgia, Denmark, Finland, Sweden, Belgium, Netherlands, UK plus the average for the current 28 EU member states).

Unfortunately data availability for non-EU Eurasian countries is limited. While data on internet use (e.g., from ITU) is available, it does not differentiate on the frequency of internet use to same degree as Eurostat statistics – and not yet available for 2014. Similarly, ITU data on the percentage of individuals with home access to the internet has only been collected sporadically. Publically available data for the 18 selected Eurasian countries is included in Tables 2 and 3.

Table 2 Percentage of individuals who use the internet selected in Eurasian countries

	2008	*2012*	*2014*
Baltic			
Estonia	61	74	82
Latvia	57	70	72
Lithuania	50	64	69
Caucasus			
Armenia	6	15	25*
Azerbaijan	17	27	46*
Georgia	10	20	27*
Central Europe			
Austria	66	76	77
Czech Republic	51	66	76
Slovenia	52	65	68
Eastern Europe			
Belarus	23	27	32*
Russia	27	29	43*
Ukraine	11	18	23*
Nordic			
Denmark	80	89	92
Finland	78	88	90
Sweden	83	91	91
Western Europe			
Belgium	66	78	83
The Netherlands	83	91	91
UK	70	84	89

NB * = 2013 data.

Source: Eurostat (2014) and ITU (2014)

Unfortunately the ITU and UN data are not directly comparable to the Eurostat data used in this paper. Similarly, the ITU-UN data in Tables 2 and 3 raise a number of questions, for instance: Why would 67% of Russians households in 2013 pay for home internet access, when only 43% of Russians confirm that they used the internet? As a similar pattern is observed for all six countries in the Caucasus and Eastern Europe sample, the ITU-UN data will not be used in the paper.

4.2 Linear relationships between internet access and frequency of use

Focusing on available Eurostat statistics for the Baltic, Nordic, Central and Western European country samples, Figure 1 show that there is a positive linear relationship between the propensity to buy internet access for home use and frequency of internet use.

Table 3 Percentage of households with internet access in selected Eurasian countries

	2008	*2012*	*2014*
Baltic			
Estonia	57	74	83
Latvia	53	69	73
Lithuania	51	60	66
Caucasus			
Armenia	–	22#	–
Azerbaijan	–	47	–
Georgia	–	–	35*
Central Europe			
Austria	69	79	81
Czech Republic	46	65	78
Slovenia	59	74	77
Eastern Europe			
Belarus	–	–	52*
Russia	–	–	67*
Ukraine	–	36	–
Nordic			
Denmark	82	92	93
Finland	72	87	90
Sweden	84	92	90
Western Europe			
Belgium	86	94	96
The Netherlands	64	78	83
UK	71	87	90

NB # = 2011 data, * = 2013 data.

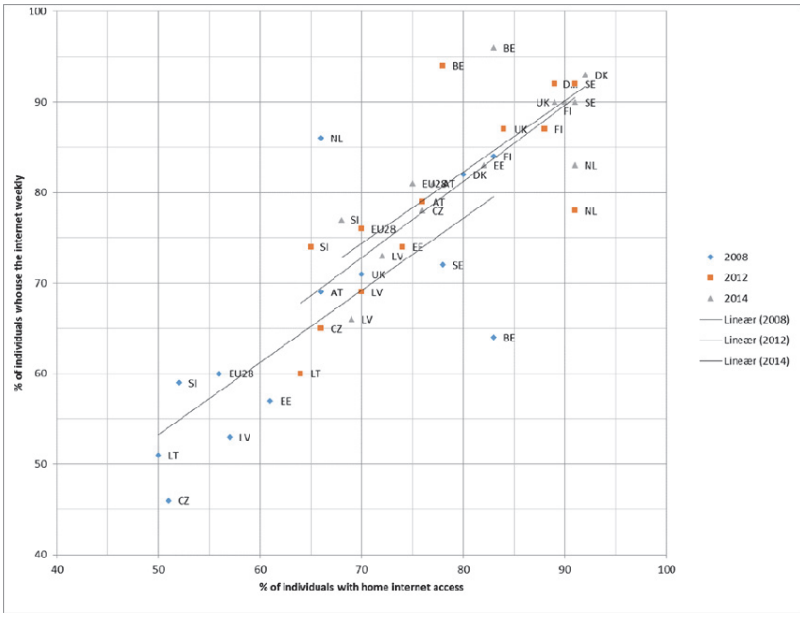
Source: Eurostat (2014) and ITU (2014)

Running a year-on-year Spearman non-parametric correlation test confirms the positive relationship between the frequency of use and internet access at home. In fact, the Spearmen test is persistent year-on-year, and becomes statistically more significant over time as, illustrated by the change from 2008 to 2014 in Table 4.

Table 4 Spearman correlation test for home internet access and frequency of internet use, 2008 and 2014

	2008	*2004*
Correlation coefficient	0.758	0.818
Significant (2-tailed)	0.004	0.001
N	12	12

Figure 1 The linear relationship between internet access and frequency of use (see online version for colours)



Source: Eurostat (2014)

Similar data samples highlight a close linear relationship between the frequency of internet use and the take-up of services such as online banking. The linearity confirms the results identified in a similar exercise but for a smaller country sample (latter consisting of Austria, Denmark, Estonia, Finland, Sweden, Netherlands, UK) and different data series (i.e., 2008, 2011, 2013) (Meyerhoff Nielsen, 2014, 2015). Again a year-on-year Spearman non-parametric correlation test confirms the positive relationship between the frequency of internet use and the propensity to one online banking. The Spearmen test is persistent year-on-year, and becomes statistically more significant over time as, illustrated by the change from 2008 to 2014 in Table 5.

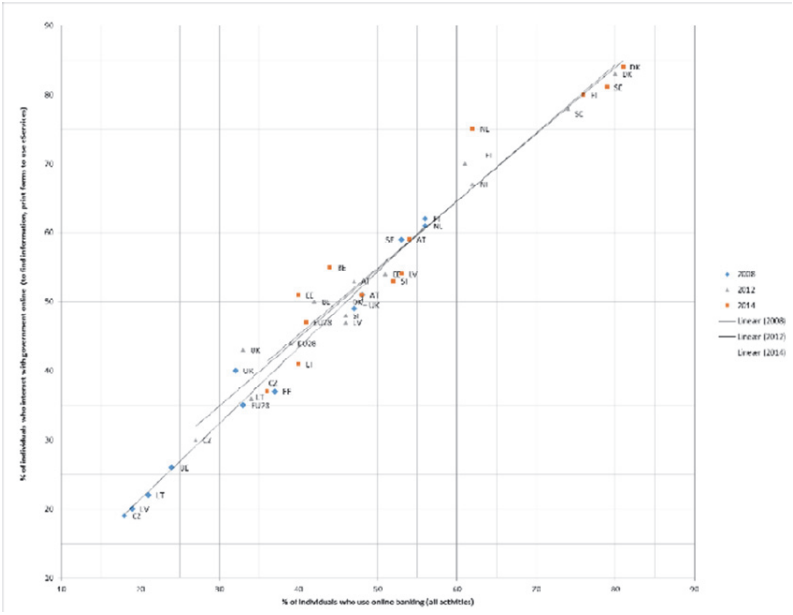
Table 5 Spearman correlation test for frequency of internet use and the use of online banking, 2008 and 2014

	2008	*2004*
Correlation coefficient	0.828	0.856
Significant (2-tailed)	0.001	0.000
N	12	12

4.3 Linear but muddled relationship between internet use and the use of e-government services

While it may be fair to assume that increasing internet use, lead to a raising use of both private and public sector service offer online, the data sample presented in Figure 2 does not fully support this. What the sample does indicate, is an emerging gap between countries who are relatively more successful in ensuring the use of online public sector service offers (e.g., Denmark, Finland, Sweden and The Netherlands), and countries who are not (e.g., Austria, Belgium, Czech Republic, Estonia, Latvia, Slovenia and the UK).

Figure 2 Increasingly non-linear relationship between the use of public and private online services offers (see online version for colours)



Source: Eurostat (2014)

Digging deeper in available data for e-service use, statistics show that more than 80% of all address changes in Denmark are made online, while the equivalent measly 0.0002% in Japan (Meyerhoff Nielsen and Igari, 2012). Statistical analysis, too, fails to shed light on the underlying reasons for why Danes use of the internet to interaction with public administration (84%) more often than their Dutch, Finnish and Swedish counterparts (75%, 80% and 81%, respectively) (Eurostat, 2014).

Running a year-on-year Spearman non-parametric correlation test does not make things more clear. While the Spearman test confirm the positive relationship between the frequency of internet use and the propensity to use public sector e-services, the

relationship becomes weaker and statistically less significant over time, as illustrated by the change from 2008 to 2014 in Table 6.

Table 6 Spearman correlation test for frequency of internet use and the use of government e-services, 2008 and 2014

	2008	*2004*
Correlation coefficient	0.803	0.639
Significant (2-tailed)	0.002	0.025
N	12	12

4.4 What about take-up?

The data examples in the previous sections (Sections 4.2 and 4.3), highlight the limitations of current research. Particular in relation to the variables influencing the successful take-up of online government service offers. There is, therefore, a need to unearth the underlying reasons for why countries with similar levels of internet availability and use, differs in their level of online interaction with the public sector. For instance, similar numbers of households in Denmark, the Netherlands, Finland and Sweden pay for having home internet access (all in the 90+ %-tile), and their citizens have similar patterns of internet (also in the 90+ %-tile) and online banking use (all in the 80+ %-tile) (Eurostat, 2014). Despite this, Danes are more likely to interaction with the public sector (81%) and complete service transactions online (66%) than their Dutch (62% and 57%), Finnish (76% and 56%) and Swedish (79% and 50%) peers (Meyerhoff Nielsen, 2013; Eurostat, 2014).

The need to address both supply and demand side issues is confirmed by governance successes and failures in various countries – including those for which data are presented in this paper. In fact, looking closer at available data (presented in Figures 3–5 at the end of the paper) it becomes clear that linearity between the frequency of internet use, the propensity to pay for home access to the internet and use online banking does not necessarily translate to an increase in online public sector service use (like finding information or use e-services). What national developments since 2008 (in Figures 3–5) illustrate, is that the successful promotion of digital solutions is the result of a number of interrelated factors, and that it is dependent on a coordinated, two-pronged approach (as illustrated in Figure 6):

- Legislation, channel strategies and communication can help increase the volume of service delivery online. This leads to an increased incentive to invest in online services and ICT infrastructure, link and integrate systems across organisational boundaries and share and re-use infrastructure, data and services.
- If e-services (or websites for that matter) are badly designed, however, people require additional help and are more likely to abandon the online services, thus leading to a lower than expected return on investment. Personal, proactive and user-friendly service design – if done right – is thus an activity that minimises risk and improves quality.

Figure 3 Relationship between use of, home access, use of online banking and the propensity to use online public sector transactional services, download forms and obtaining information in EU28 and 18 selected countries (2008) (see online version for colours)

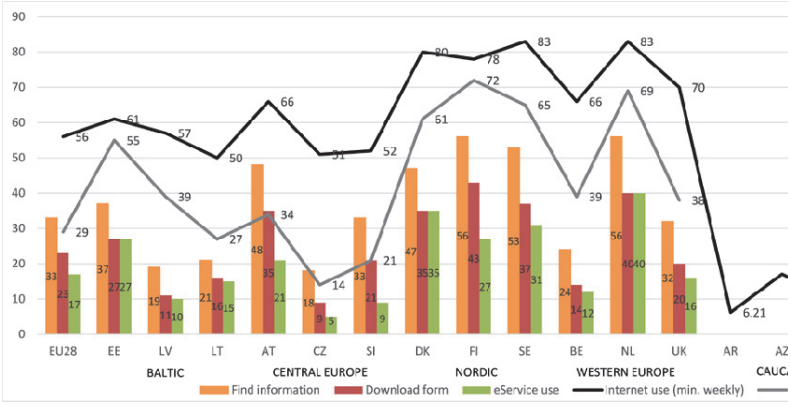
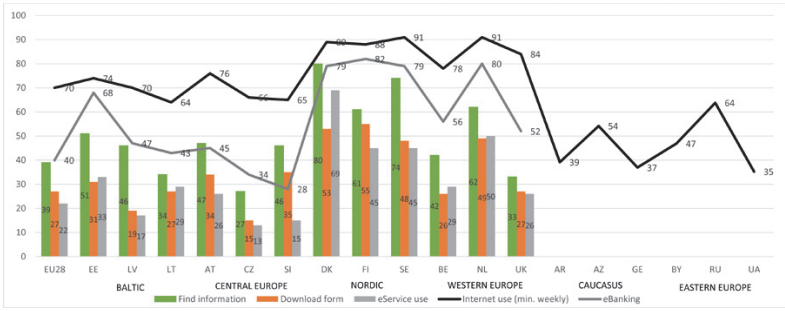


Figure 4 Relationship between use of, home access, use of online banking and the propensity to use online public sector transactional services, download forms and obtaining information in EU28 and 18 selected countries (2012) (see online version for colours)



Source: Meyerhoff Nielsen (2014)

In the period 2008–2014, the frequency with which Danes consult public sector websites to find answers to their questions and carry out online service transaction has outstripped those of other high performers such as the Netherlands, Finland and Sweden. In fact, e-service use in Denmark has increased by 9%-, 10%- and 16%-points more than amongst the Dutch, Finns and Swedes (see Figures 4 and 5), despite similar growth levels in internet and online banking use (Eurostat, 2014).

The Danish success is largely due to a coordinated cross-governmental focus on channel strategies and the promotion of digital service delivery. These initiatives has since 2011 lead to a strengthened strategic focus and governance mandate which in turn is underpinned by increased cross-governmental cooperation and legislative changes which makes it mandatory to use digital transaction services for selected high-frequency, high-volume service areas. The use of legislation to move service delivery from analogue to digital channels, and the strategic focus on channel strategies is evident in the

2008–2014 data for Denmark presented in Figures 4 and 5 (DIGST, 2011). Not only has the number of Danes using the government e-services and who obtain information online increased, but as printable/downloadable forms are eliminated the number of people accessing them has naturally stagnated (Eurostat, 2014).

Figure 5 Relationship between use of, home access, use of online banking and the propensity to use online public sector transactional services, download forms and obtaining information in EU28 and 18 selected countries (2014) (see online version for colours)

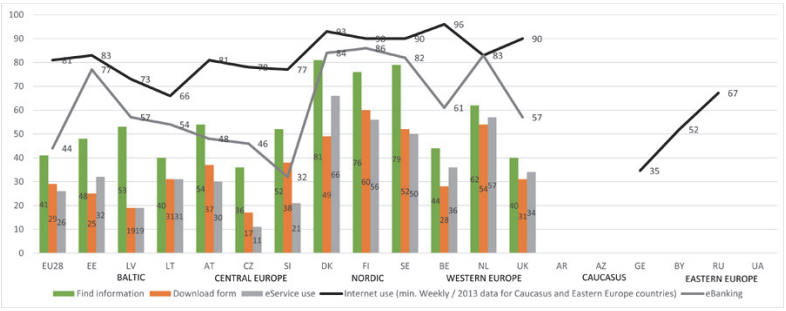
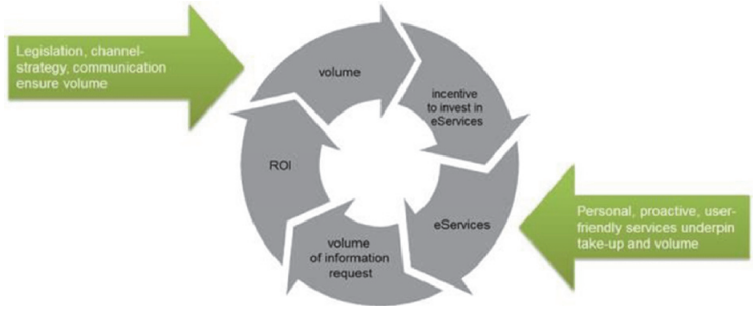


Figure 6 Interrelationships summarised (see online version for colours)



The Danish approach to governance and cooperation stands in contrast to weaker governance mandates and less vertical and horizontal cooperation in countries like Finland, the Netherlands, Sweden and UK – although countries like Finland and Georgia (DEA, 2014) are implementing governance and cooperation structures similar to those of Denmark, and the Dutch have established a national digital commissioner and unit to identify a new governance model, at the time of writing (Meyerhoff Nielsen, 2014, 2015; Rijkoverheid, 2014).

4.5 Research gap

What the Spearman tests in this paper reveal is a statistical relevant and positive correlation between the different variables analysed. Unfortunately, the influence of raising internet use is not clearly reflected in the Spearman tests for public sector

e-service use. There is thus a need to look at the influence of other variables such as the relative cost of internet.

While governance success factors, like those in Denmark, are highlighted in numerous illustrative examples in UN, OECD and European Commission publications, the interdependencies among these factors are yet to be analysed in depth. Similarly, governance factors have not been successfully modelled into a framework that is based on the actual experiences in multiple countries. There is therefore a need to identify the degree to which governance and cooperation models ensure the successful supply and use of online e-services.

5 Governance and stage models

On the basis of the research gap, in Section 4.4, an appropriate theoretical framework to assess and map the degree to which governance and cooperation models ensure the successful supply and use of online e-services, may be found in the e-government stage model literature. This section therefore outlines the focus of a number of key e-government stage and maturity models.

5.1 Review of existing stage models

Layne and Lee refer to the experiences of e-government as chaotic and unmanageable, arguing for the importance of dividing development into distinguishable stages (Layne and Lee, 2001). To this effect, e-government research has largely focused on stage, or maturity, models.

A multitude of stage models has been suggested by researchers, consultants, national authorities and international organisations. In this context academics differentiate between three types of stage-models (Concha et al., 2012; Fath-Allah et al., 2014):

- *Governmental models*: Models developed by governments, consultants and academics to help authorities identify and improve their level of maturity (generally using predefined models and toolkits).
- *Holistic approach models*: Models designed to assist authorities (generally predefined models, toolkits and indicators) in project implementation and to determine if the project will be successful or not.
- *Evolutionary e-government maturity models*: Models which focus on sequential evolutionary steps, for instance from immature to mature e-government with improved quality (often from an academic perspective).

The literature review carried out in connection with this paper focus on governmental and evolutionary maturity models, as the holistic approach focus mainly on project implementation.

Using the methodology outlined in Section 2, 30 stage models are identified. The following subsections gives an overview of their respective characteristics (presented chronologically by the year they first appeared in the literature, and alphabetically by author(s)).

5.1.1 ANAO: Australian national audit office (ANAO, 1999)

In 1999, four-stage maturity model by the Australian National Audit Office (ANAO) was introduced to categorise and evaluate process to guide agencies in their decision as to what services could and should provide. The levels of maturity are:

- publishing and information
- interaction
- transaction of secure information (incl. login)
- sharing information with other agencies (incl. business and citizens).

The model is national in character and takes an abductive-deductive approach to e-government maturity. The model is developed based on experiences in Australia.

5.1.2 Deloitte research (Deloitte and Touche, 2001)

The model proposed by Deloitte in 2001 focus on supply, technology and organisational integration. It adds a dimension of engagement and co-creation (indirectly by non-governmental stakeholders). The maturity levels are:

- *Information publishing/dissemination*: Websites with static information.
- *'Official' two-way transaction*: Electronic identity management (eID) and e-services.
- *Multi-purpose portals*: Portals (i.e., a degree of vertical and horizontal integration).
- *Portal personalisation*: Basic personalisation and life-events.
- Clustering of common services (i.e., increased personalisation and life-event, increase integration).
- *Fully integration and enterprise transaction*: Life-events, full personalisation, user-centric and engagement in service choice and delivery.

The model is developed by a consultancy and takes a deductive approach to e-government maturity. The model has been applied to Australia, Canada, New Zealand, UK and USA.

5.1.3 Gartner group (Baum and Di Maio, 2000)

First published in 2000, the Gartner model consists of four stages. It is one of the earliest e-government maturity models not emerging out of a national context. The Gartner model focus is on supply and technology with a degree of integration. The stages of maturity are:

- *Information*: Information, websites with static content.
- *Interaction*: Emails and downloadable forms.
- *Transaction*: Integrated websites with transaction (i.e., e-service).
- *Transformation*: Seamlessly integrated websites (i.e., a degree of vertical and horizontal integration).

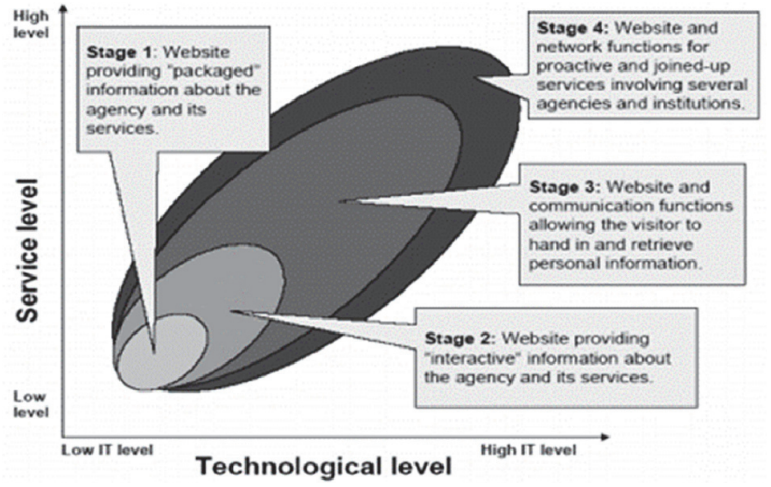
The model is developed by a consultancy and takes a deductive approach to e-government maturity.

5.1.4 SAFAD (Swedish Agency for Administrative Development/Statskontoret) (Statskontoret, 2000)

Published in 2000, the Swedish Agency for Administrative Development (SAFAD, or Statskontoret) is a four-stage maturity model inspired by the Australian National Audit office. It was introduced to categorise and evaluate process to guide agencies in their decision as to what services could and should provide. The stages of maturity are (illustrated in Figure 7):

- *Websites*: Packages of information.
- Interactive websites.
- *Web and communication*: Information plus entry and retrieval of personal information.
- Website and network functions.

Figure 7 SAFAD four-stage maturity model



Source: Persson and Goldkuhl (2005)

The model is national in character and takes an abductive-deductive approach to e-government maturity. It is inspired by the ANAO model and experiences in Sweden.

5.1.5 Hiller and Bélanger (2001)

Hiller and Bélanger's 2001, five-stage maturity models focus on supply, technology and organisational integration and some aspects of participation in a democratic sense. The maturity levels are:

- *Web presence*: Technological leapfrogging, websites with static information).
- *Interaction*: Simple interaction, email and downloadable forms.
- *Transaction*: E-services.
- *Transformation/integration*: Back office automation and digitisation of processes. Aspects of vertical and horizontal integration.
- *Participation*: Transparency, release of data.

It is a scientific model, with an inductive approach to e-government maturity.

5.1.6 Howard (2001)

Published in 2001, M. Howard propose a simple three-stage maturity models, namely:

- publish (i.e., static information)
- interact (i.e., information increasingly updated, downloadable forms etc.)
- transact (i.e., e-services).

It is a scientific model, with an inductive approach to e-government maturity.

5.1.7 Layne and Lee (2001)

Layne and Lee's 2001 maturity model is the most cited to date. The focus is on technology, supply and organisational integration. Four-stages of maturity are defined (illustrated in Figure 8):

- *Catalogue*: Online presence (i.e., websites with static information and downloadable forms).
- *Transactional*: Service and forms (i.e., e-services).
- *Vertical integration*: Local system integration.
- *Horizontal integration*: Integration across function (i.e., life-events and personalisation).

It is a scientific model, which takes an abductive approach to e-government maturity. The model is developed based on observations in the USA and earlier models.

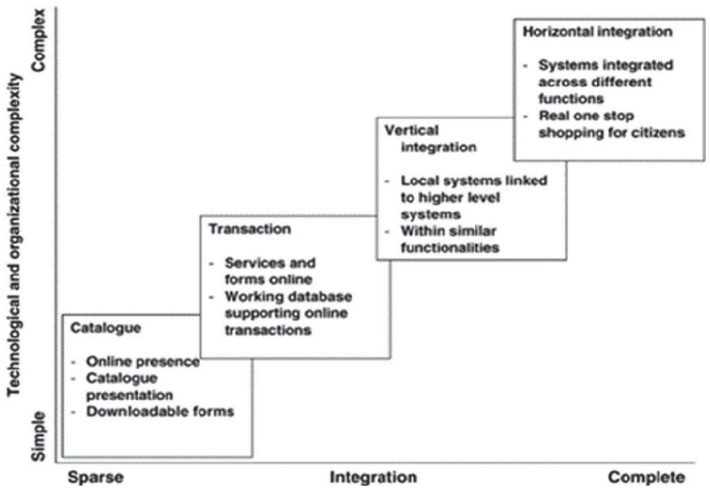
5.1.8 United Nations (UNDESA 2012, 2014)

The UN eGovernment Readiness Index has been in use since 2001. It covers pre-conditions such as supply, technology and integration. The original focused has been on the five-stages of maturity. The UN publishes the bi-annual eGovernment Readiness Index, but has in the last few years refocused the models to include additional aspects of engagement and transparency (e.g., the UN eParticipation Index). The maturity levels are:

- *Emerging presence*: Basic websites with static information.
- *Enhanced presence*: Emerging portals (i.e., a degree of vertical and horizontal integration), interactivity, and customer services (i.e., e-services).
- *Interactive*: Two way interactivity (i.e., e-services and communication), searchable intranet.
- *Transactional*: E-services.
- *Seamless*: Fully networked government (i.e., horizontal and vertical integration).

It should be noted that the model has a pre-condition stage which focus on at network preparedness, access to PCs, the internet and literacy and digital competences (i.e., TII Index).

Figure 8 Layne and Lee model four-stage maturity model



Source: Layne and Lee (2001)

The model is 'international' in character and takes an abductive-deductive approach to e-government maturity. The model consists of a biannual ranking of 193 countries.

5.1.9 Wescott (2001)

The 2001 Wescott model consist of six stages.

The maturity levels are:

- *Setting up an email system and internal network*: Feature email systems to improve information sharing, coordination and feedback.
- *Enabling inter-organisational and public access to information*: Information is department centric, shared between organisations and can be accessed by the public over the internet.

- *Two-way communication*: Basic e-services and citizens can make suggestions using emails or ask questions in forums and receive answers.
- *Exchange of value*: E-service features applications such as tax assessments and license renewals. At this stage, the citizen can make secure payments online.
- *Digital democracy*: Focus is on empowering the civil society (e.g., increasing awareness of government corruption) and allowing citizens to vote and express their opinions and feedback.
- *Joined-up government*: Vertical and horizontal integration allowing for citizens to execute services without knowing which government agency is responsible for.

It is a scientific model, with an abductive approach to e-government maturity. It has been developed based on observations in the Asia-Pacific.

5.1.10 Chandler and Emanuels (2002)

Published in 2002 Chandler and Emanuels propose a four-stage model. The maturity levels are:

- *Information*: Online information about government services and policies.
- *Interaction*: Basic level of interaction between governments and citizens such as email systems.
- *Transaction*: Features e-services.
- *Integration*: Features integrated services across various departments and agencies.

A scientific model, with an indicative approach to e-government maturity.

5.1.11 European Union (EC, 2012)

The European Union Government benchmark is similar to the UN model and in 2002 modelled is the SAFAD example. The focus is on supply, technology and integration and initially included five-stages of maturity. The European Commission publishes its e-government benchmark yearly, but has since 2010 started including additional biannual focus areas, and has moved from benchmarking services to life-events, user engagement, access to personalised data and user-rating – through mystery shoppers and surveys:

- *Emerging presence*: Basic websites with static information.
- *Enhanced presence*: Emerging portals (i.e., a degree of vertical and horizontal integration), interactivity, and customer services (i.e., e-services).
- *Interactive*: Two way interactivity (i.e., e-services and communication), searchable intranet.
- *Transactional*: E-services.
- *Seamless*: Fully networked government (i.e., horizontal and vertical integration).

Note that the model has a pre-condition stage looking at PC and internet accessibility as well as digital literacy.

The model is 'international' in character and takes an abductive-deductive approach to e-government maturity. The model is developed with inspiration from the SAFAD model and experiences in the EU+ member states. The model forms the basis of the EU's annual e-government benchmarks and surveys.

5.1.12 Moon (2002)

The 2002 published five-stage model by M.J. Moon focus on supply, technology and organisational integration and some aspects of participation in a democratic sense. It is very similar to the 2001 model proposed by Hiller and Bélanger (2001). The maturity levels are:

- *Web presence*: Technological leapfrogging, websites with static information).
- *Interaction*: Simple interaction, email and downloadable forms.
- *Transaction*: E-services.
- *Transformation/integration*: Back office automation and digitisation of processes. Aspects of vertical and horizontal integration.
- *Participation*: Transparency, release of data.

It is a scientific model, with an abductive approach to e-government maturity. It was developed based on observations and data from 2000 US municipality websites.

5.1.13 Netchaeva (2002)

Published in 2002, I. Netchaeva propose a five-stage model for e-government and e-democracy. Although not named the maturity levels are:

- *Scattered information*: Websites with department information.
- *Emails and FAQ*: Features FAQs and email systems.
- *Other online services*: Features forums and opinion surveys.
- *E-government portals*: Includes e-services such as license renewals and payment of fines, portals and one-stop-shops.
- *Possible democracy*: Citizens can vote, contribute in online discussions and make comments on policy and legislation proposals.

It is a scientific model, with an inductive approach to e-government maturity.

5.1.14 UKNAO: UK National Audit Office (NAO, 2002)

In 2002, the UK National Audit Office (UKNAO) presented a report to the House of Commons, in which a five-state maturity model is introduced. The maturity levels are:

- *Basic site*: Limited information available online, mainly information about authorities.
- *Electronic publishing*: Increasing number of website and more content.

- *E-publishing*: Use of personalisation options and customisable search tools. Some forms can be submitted online and others can be downloaded. Increasing use of emails and the timely responses, alerts about new content is an offered.
- *Transactional*: Secure e-service transactions.
- *Joined-up e-governance*: Features include one-stop-shops and joined-up governments through vertical and horizontal integration.

The model is 'national' in character and takes an abductive-deductive approach to e-government maturity. The model is developed based on experiences in UK.

5.1.15 World Bank (Toasaki, 2003)

In 2002, the World Bank published a three-stage model. The maturity levels are:

- *Publish*: Online information such as rules, regulations, documents and forms.
- *Interact*: Users can provide feedback and submit comments on legislative or policy proposals.
- *Transact*: Secure e-service transactions.

The model is 'international' in character and takes a deductive approach to e-government maturity.

5.1.16 Accenture (Rohleder, 2003)

Published in 2003, the Accenture five-stage model consists of the following maturity levels:

- *Online presence*: Information is published online.
- *Basic capability*: Security and certification is developed and the online presence is broadened.
- *Service availability*: E-services are increasingly available on portal(s). This stage also features cross agency cooperation. Services increasingly designed to meet customer needs.
- *Mature delivery*: E-services are clustered with clear ownership and authority – CIO (Chief Information Officer) or central agency. The customer is involved in the process of e-government and the services are marketed.
- *Service transformation*: Improved customer service delivery is the objective. Other features include multi-channel integration.

The model is developed by a consultancy and takes a deductive approach to e-government maturity. The model has been applied to Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Malaysia, Mexico, the Netherlands, Norway, Portugal, Singapore, South Africa, Spain, the UK and USA. Based on the model Accenture publish an annual e-government ranking of selected countries.

5.1.17 Reddick (2004)

In 2004, two-stage model, published my Reddick is one of the most simple maturity models identified. The maturity levels are:

- *Cataloguing*: Online information about the government and its activities.
- *Transactions*: E-services and one-stop-shops.

It is a scientific model, with an abductive approach to e-government maturity. The model is developed based on observations in the USA.

5.1.18 Waseda (Obi, 2014)

First published in 2004 the Waseda model publish annual benchmarks for selected countries it differs somewhat from other stage models as it does not define distinct levels of maturity. The focus is on qualitative and quantitative indicators including:

- Network preparedness and infrastructure.
- Management optimisation and efficiency.
- *Online presence*: Online information, services, national portals and websites.
- *Governance*: Governance, cooperation and promotion.
- E-participation and digital inclusion.
- Open government.
- Cyber security.

The indicators can be grouped into four-stages including:

1 networked preparedness and infrastructure

2 online services/e-services.

3 management optimisation.

4 e-participation.

The model is 'international' in character and takes an abductive-deductive approach to e-government maturity. The model is used for an annual e-government ranking list for an increasing number of countries.

5.1.19 West (2004)

Published in 2004 the West models have four-stages. The maturity levels are:

- *Bill-board*: Websites are mere billboards mainly used for posting information.
- *Partial-service-delivery*: Ability to search for data via search engines with some e-services available.

- *Portal*: Portals containing all information and e-services (i.e., a one-stop.-shop).
- *Interactive democracy*: Portals offers personal and proactive online service, utilise push technology and feedback forms.

A scientific model, with an abductive-deductive approach to e-government maturity. The model is developed based on observations and data from 1813 and 1680 US municipality websites model in 2000 and 2001. The West Index on US municipalities and a number of countries is based on the model.

5.1.20 Windley (2002)

The 2004, four-stage model, published by Windley consists of the following maturity levels:

- *Simple website*: Static pages with downloadable forms.
- *Online government*: Features interaction mechanisms such as emails, online forms, help and FAQs.
- *Integrated government*: Includes e-services, i.e., end-to-end transactions, but also emerging internal integration as information is shared between departments.
- *Transformed government*: Customer centric e-services organised according to user needs and segmented according to population groups and life events. Vertical and horizontal integration is also a feature.

It is a scientific model, which takes a deductive approach to e-government maturity. It is developed based on observations from the US Utah.gov site.

5.1.21 Siau and Long (2005)

Siau and Long's five-stage maturity models focus on supply, technology and organisational integration and some aspects of participation in a democratic sense. It differs from the Moon (2002), Hiller and Bélanger (2001) models by including engagement and political decision-making to the fifth stage in the form of an 'e-democracy stage'. The maturity levels are:

- *Web presence*: Technological leapfrogging, websites with static information).
- *Interaction*: Simple interaction, email and downloadable forms.
- *Transaction*: E-services.
- *Transformation/integration*: Back office automation and digitisation of processes. Aspects of vertical and horizontal integration.
- *E-democracy*: Engagement, political decision-making, transparency, release of data.

It is a scientific model, with an inductive approach to e-government maturity.

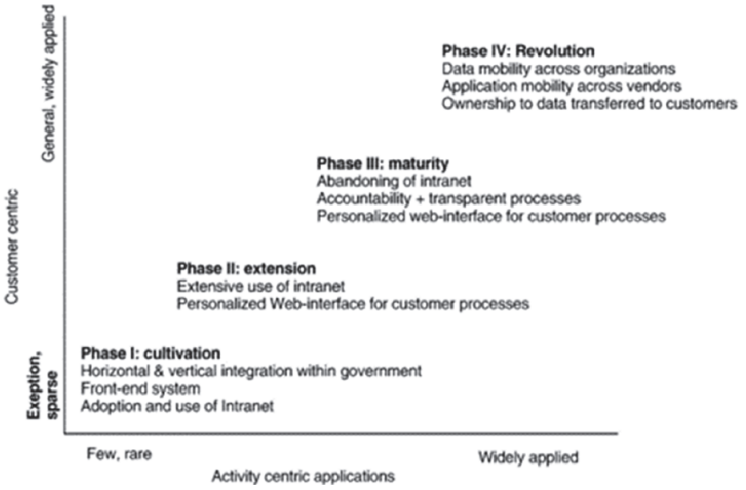
5.1.22 Andersen and Henriksen (2006)

The 2006 Public Sector Process Rebuilding Model (PPR) by Andersen and Henriksen builds on Layne and Lee's four-stage maturity model (Layne and Lee, 2001). The PPR

model focus on supply, organisational integration, processes and differs from other models by emphasising user-centricity rather than technological aspects. Four-stages of maturity, of which the first two stages comprise the four-stages proposed in the Layne and Lee model (illustrated in Figure 9):

- *Cultivation*: Websites with static information, downloadable forms, vertical and horizontal integration.
- *Extension*: E-services, basic personalisation and life-events. Focus on data ownership.
- *Maturity*: E-services, non-internet interphases, increased personalisation, user-centricity and outcome-based organisation in focus. Economics of scale sought, data ownership more fluid, mobility of data and open data-based infrastructure.
- *Revolution*: Seamless organisational structures, fully personal and outcome-based service delivery. Data ownership and focus fully transferred to the end-user.

Figure 9 Andersen and Henriksen PPR model



Source: Andersen and Henriksen (2006)

It is a scientific model, with an abductive-deductive approach to e-government maturity. It is developed based on observations and data from 110 central government sites in Denmark.

5.1.23 Persson and Goldkuhl (2005)

In 2005, Persson and Goldkuhl evaluates a number of existing models and propose a two-stage model from a computer science perspective. The maturity levels are:

- *Integration of services*: Focus on public services, directed services, concentrated services and portals.
- *Integration in services*: Elements include the integration of services and agencies, transparency in processes of independent processes, database access in information gathering, information or decision provision requirements and joint information services.

It is a scientific model based on Layne and Lee, but developed from a computer science perspective.

5.1.24 Cisco (Cisco IBSG, 2007)

The 2007 model published by IT and consultancy firm Cisco contain three-stages. The maturity levels are:

- *Information interaction*: Features departmental websites, legislative posting, public notices, online forms, webcasting and personalised portals.
- *Transaction efficiency*: E-services and portals including electronic payments like online taxes and e-procurement.
- *Transformation citizen centric*: Consolidated and shared administrative services at this stage are across various government jurisdictions.

It is a scientific model, with an abductive approach to e-government maturity.

5.1.25 Chan et al. (2008)

The 2008 model proposed by Chan et al. focus on supply, technology and organisational integration. It adds non-governmental stakeholders to the mix. Five-stages of maturity:

- *Publish*: Websites with static information.
- *Interact*: Downloadable forms.
- *Transact*: E-services.
- *Integrate*: Vertical and horizontal integration of service providing agencies.
- *Tri-party integration*: Integration of public, private and stakeholder organisations.

It is a scientific model, with an abductive approach to e-government maturity. The model is developed based on observations and data from regional government in China.

5.1.26 Shahkooh et al. (2008)

Published in 2008 Shahkooh et al. propose a five-stage model. The maturity levels are:

- *Online presence*: Online information.
- *Interaction*: Citizens can interact with governments through email to officials and downloading forms.
- *Transaction*: Secure e-service transactions like payments and tax filling.

- *Fully integrated and transformed e-government*: Government services are organised as a single point of contact such as portals.
- *Digital democracy*: Features online voting, public forums and opinion surveys.

It is a scientific model, which takes an abductive approach to e-government maturity.

5.1.27 Almazan and Gil-Garcia (2008)

The Almazan and Gil-Garcia six-stage model published in 2008 propose the following maturity levels:

- *Presence*: Limited static information online.
- *Information*: Increasing volumes of information and webpages available. Frequency of updates increase.
- *Interaction*: Downloadable forms and communicate with the government via email.
- *Transaction*: Secure e-service transactions and payment options.
- *Integration*: One-stop-shops and portals and vertical and horizontal integration.
- *Political participation*: Offer users voting and participation in opinion polls, surveys and public forums.

It is a scientific model, with an abductive approach to e-government maturity. It has been developed based on observations and data from 32 Mexican state website.

5.1.28 Kim and Grant (2010)

Published in 2010, Kim and Grant propose a five-stage model. The maturity levels are:

- *Web presence*: Features simple and limited information online.
- *Interaction*: Focus on search engines and downloadable forms.
- *Transaction*: Includes online transactions with the possibility of electronic payments.
- *Integration*: Horizontal and vertical integration and performance measurements using statistical techniques.
- *Continuous improvement*: Features political activities and a focus on continuous improvements and performance.

It is a scientific model, with an inductive approach to e-government maturity.

5.1.29 Alhomod and Shafi (2012)

In their 2012 evaluation of 25 existing models, Alhomod et al. propose a redefined four-stage model. The maturity levels are:

- *Presence on the web*: Portal merely provide information.
- *Interaction between the citizen and the government*: Downloadable and email forms made available for use.

- *Complete transaction over the web*: Secure e-service transactions. Two-way communication.
- *Integration of services*: Horizontal and vertical integration between authorities to share information and data.

It is a scientific model, with an abductive approach to e-government maturity.

5.1.30 Lee and Kwak (2012)

Published in 2012, Lee and Kwak suggest a five-stage model with a focus on engagement and data exchange. The maturity levels are:

- *Initial conditions*: Not to be confused with 'pre-conditions' (e.g., UN, EC and Waseda models) the focus is on one-way static interaction from authorities to citizens.
- *Data transparency*: Limited use of Web 2.0 and social media. Objective is to get public feedback on the usefulness and data quality.
- *Open participation*: Increasing use of Web 2.0 and social media tools to increase transparency and engagement, and includes e-voting and e-petitioning.
- *Open collaboration*: Interagency collaboration by sharing data and public input. Public contests are organised and data are analysed for obtaining new insights and improving decision-making.
- *Ubiquitous engagement*: Data are easily accessible via mobile devices. Data are vertically and horizontally integrated and data analytics is used for decision-making processes. Authorities focus on continuous improvements.

It is a scientific model, which takes an abductive approach to e-government maturity. The model is developed based on observations and data from the US health sector.

5.2 Characteristics of identified stage models

5.2.1 General observations

Looking at the 30 stage models identified, and described in Section 4.1., some general observations include:

- three models are national in origin (ANAO, 1999; Statskontoret, 2000; NAO, 2002) – although more may exist
- three models are international in nature (UNDESA, 2001; EC, 2002; Toasaki, 2003)
- four models are proposed by consultancy firms (Baum and Di Maio, 2000; Rohleder, 2003; Cisco, 2007)
- 20 models are scientific in nature.

5.2.2 Identified meta stages

Using the adapted Walsh and Downe model, qualitative key word and meta-synthesis analysis (see Section 3.3) to identify the definitions of the individual stages in each of the

30 models 11 different meta stages are identified. The various models and their respective stages are mapped in Table 7 (at the end of this paper) and varies from pre-conditions to transformation (or morphing) and e-democracy.

Table 7 30 stage-model and their 11 meta stages

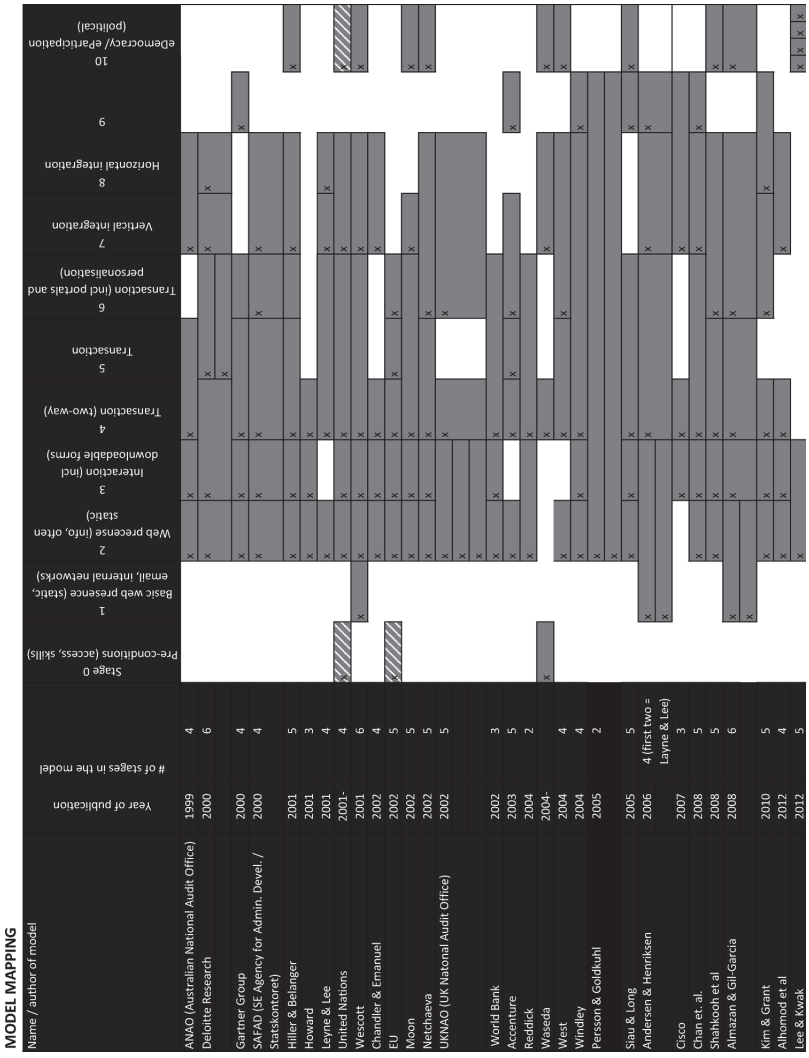


Table 8 30 stage-models, 11 meta stages and their five meta characteristics presented in Lee's qualitative meta-synthesis framework

META MAPPING

Name / author of model	Year of publication	# of stages in the model	Pre-conditions (0)	Presenting (1+2+3 / Lee presenting)	Transaction (4+5 / Lee assimilation, transaction)	Reforming /User-centric (6+7+8 / Lee Reforming)	Morphing / Personal (9 / Lee Morphing)	eDemocracy (10 / Lee eGovernance)	Ranking/ benchmark/ index/ evaluation
ANAO (Australian National Audit Office)	1999	4		2+3	4+5	6+7			
Deloitte Research	2000	6		2+3	4+5	7+8			
Gartner Group	2000	4		2+3	4+5	6+7+8	9		
SAFAD (Swe Agency for Administrative Development / Statskontoret)	2000	4		2+3	4+5	6+7+8			
Hiller & Belanger	2001	5		2+3	4+5	6+7+8		10	
Howard	2001	3		2+3	4				
Leyne & Lee	2001	4		2	4+5	6+7+8			
Silcock	2001	6		2	4+5	6+7+8	9		
United Nations	2001-	4	0	2+3	4+5	6+7+8		(10)	x
Wescott	2001	6		1+2+3	4+5	6+7+8		10	
Chandler & Emanuel	2002	4		2+3	4	7+8			
EU	2002		0	2+3	4+5	6		(10)	x
Moon	2002	5		2+3	4+5	6+7+8		10	
Netchaeva	2002	5		2+3	4+5	6+7+8		10	
UKNAO (UK Natonal Audit Office)	2002	5		2+3	4	6+7+8			
World Bank	2002	3		2+3	4+5	6			
Accenture	2003	5		2	4+5	6+7	9		
Reddick	2004	2		2+3	4+5	6			
Waseda	2004-		0		4	7+8		10	x
West	2004	4		2	4+5	6+7+8		10	x
Windley	2004	4		2+3	4+5	6+7+8	9		
Siau & Long	2005	5		2+3	4+5	6	9	10	
Persson & Goldkuhl	2005	2		1+2+3	4+5	6+7+8	9	10	
Andersen & Henriksen	2006	4		(1)+2+3	4+5	6+7+8	9	(10)	
Cisco	2007	3		3	4	7+8	9		
Chan et. al.	2008	5		2+3	4+5	6+7+8	9		
Shahkooh et al	2008	5		2+3	4+5	6+7+8		10	
Almazan & Gil-Garcia	2008	6		1+2+3	4+5	6+7+8		10	
Kleivink & Janssen	2009	5				6+7+8	9		
Kim & Grant	2010	5		2+3	4	6+7+8	9	(10)	
Alhomod et al	2012	4		2+3	4	8			
Lee & Kwak	2012	5		2+3			(9)	10	
Dias & Gomes	2014	12 / 3 domains		1+2+3	4+5			(10)	x
Heeks	2015	7 / 2 domains		2+3	4+5	6+7+8	9		

While the various models are based on different perspectives and use different definition and metaphors, they can be difficult to understand and surmise. To alleviate this difficulty, the 11 meta stages presented in Table 7, are distilled further using the Lee's qualitative meta-synthesis framework (Lee, 2010). Using Lee's semantic framework consisting of five general metaphors namely: Presenting, Assimilating, Reforming, Morphing, E-governance.

5.2.3 Meta stages characteristics identified

From the analysis of the 30 models, identified in this papers literature review, it becomes clear that the 11 overarching meta stages in Table 7 represent six specific meta characteristics. In relation to Lee's framework an initial 'pre-condition' stage is missing and thus added for the purpose of this paper. The subsequent mapping of the 30 models is presented in Table 8 (at the end of this paper) and can be summarised as follows:

- 3 of 30 models incl. pre-conditions (UN, EU, and Waseda)
- 28 of 30 models incl. presenting information
- 28 of 30 models incl. transactions
- 27 of 30 models incl. aspects of integration (portals, vertical, horizontal)
- 10 of 30 models incl. morphing (new form of service provision and organisation, incl. personal, proactive, integrated)
- 14 of 30 models incl. e-democracy aspects.

5.3 Identified weaknesses and stage model research gaps

With the exemption of the PPR model (Andersen and Henriksen 2006) all other models analysed have a technology and supply orientated, i.e., have no focus on outcomes or actual use (Lee, 2010; Alhomod and Shafi, 2012). As highlighted in Section 3, this is unfortunate as the tangible benefits of any ICT solution and e-services in particularly can only be realised through the actual and effective use of supplied e-services by citizens (Meyerhoff and Kelly, 2011; Meyerhoff Nielsen, 2011; UNDESA, 2014).

Similarly, most of the models have no real understanding of core government service concepts. For instance:

- Individual service elements – that is information, transaction capability, personal data – are not separate maturity levels but rather elements in a given service request and subsequent delivery. Similarly downloadable forms are merely a type of static information and does not warrant a separate maturity level (Meyerhoff Nielsen, 2015).
- Decision-making, as illustrated by the e-participation and e-democracy stages, should not be considered an e-government maturity level. Rather engagement, petition and voting solutions should be seen service types, as the consist of information, transaction capability and some form of data, e.g., information about an election, and internet voting solution allowing for vote casting, plus data such as unique ID numbers, name and address for authorising a vote. Thus, the e-participation and e-democracy stage(s) should be seen as an indication of

democratic maturity and degree of transparency in a country not as e-government maturity levels.

- Front-office service provision and back-office integration are mixed up in a number of models. For instance, one-stop-shop portals does not constitute a form of transaction, but is rather an indicator of degree to which authorities cooperate and integration (Meyerhoff Nielsen, 2015).

None of the models identified include aspects of governance directly. Some, like the Waseda model, highlight management and coordination issues such as the existence of chief information officers (Obi, 2014). Similarly, vertical and horizontal integration, and the existence of one-stop-shops, sharing of information and data can be interpreted as aspects of cooperation between different authorities and levels of government – even private and third party stakeholders (Chen and Mingins, 2011; Lee and Kwak, 2012).

As illustrated by Tables 7 and 8 most models are merely restructure or adjust existing ones. Key exemptions are Andersen and Hendriksen's PPR model (Andersen and Henriksen, 2006) and Waseda's approach (Obi, 2014), both of which builds on existing models while attempting to address outcomes and governance issues.

6 Conclusion

This paper has identified three research gaps in current e-government and governance research (see Sections 4 and 5). To address them, the paper author will in future research attempt to answer the following questions:

- What variables positively effects e-service use and can the correlations be statistically proven?
- To what degree, and in what way, do governance and cooperation models ensure success supply and use (i.e., demand) of online citizen services?
- Can the success factors be mapped and developed into a universal governance model for successful digitisation of public sector service delivery (i.e., supply) and e-service take-up (i.e., demand) by citizens?

To successfully address the three identified research gaps the following research will be carried out by the author.

6.1 Addressing research gap 1

Statistical analysis on an expand dataset of e.g., all 28 European Union member states – as comparable data are available. Expend the data analysis to also include factors such as relative cost of internet access (e.g., in relation to GDP per capital) and educational levels. The aim would be to identify any statistically significant correlations between variables and the use of public sector e-services.

6.2 Addressing research gap 2 and 3

To successfully identify governance, cooperation and stage model the author will carry out a qualitative multi-country case study addressing three of associated themes.

First (theme 1), governance and stage models (e.g., Layne and Lee, Andersen and Henriksen or UN models), including the national governance and cooperation models identified in this paper, will be identified and analysed in terms of their strengths and weaknesses. A theoretical framework and model for mapping e-government progress, governance and cooperation will be developed. The model should address both technical and non-technical issues. The model should make use of the data collected in theme 2 and complement it with information pertaining to the level of vertical and horizontal integration, the sharing/reuse of key electronic identifiers and core data, process and organisational re-engineering and the approach to legislation in the countries selected for analysis.

A theoretical framework for analysing and mapping the various governance and cooperation approaches in relation to one another is currently lacking for theme 1, but may be developed by combining the Layne and Lee plus Andersen and Henriksen models. The framework and model developed may subsequently be used and proven in theme 3.

Second (theme 2), the current state-of-affairs in e-government will be determined though a selected number of country studies, including pre-conditions such as the availability internet, the degree of digital literacy, the availability and use of online services and the governance and cooperation model in place. Theme 2 may be assessed using a model based on level of IT skills and the willingness to purchase internet access at home (a proxy for the perceived importance, volume and attractiveness of online content and people's likelihood to serve themselves online). Alternatively, a model based on the UN eGovernment Readiness Index or the European Commission eGovernment Benchmark Survey may be applied.

Third (theme 3), demand side issues will be analysed in each of the selected countries. The framework and model developed in theme 1 should be tested in terms of the following issues: how demand for e-services is influenced by the sophistication level of available e-services (e.g., the form and degree of personalisation, user-centric and user-friendly design, etc.); how promotion and channel strategies funnel service delivery from analogue to digital channels; the role that culture and citizens' trust in technology and public administration play in relation to the resistance to online service delivery.

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Article II

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Governance Failure in Light of Government 3.0: Foundations for Building Next Generation eGovernment Maturity Models

Morten Meyerhoff Nielsen

Abstract Demographic, economic and other challenges is putting the public sector and service deliver under increasing pressure. ICT as an enabler of increased efficiency, effectiveness and transformation has long been recognized as part of the solution. National experiences show that the potential of ICT has not been fully realized, especially not in relation to Government 3.0 (Gov3.0). Existing public administration, information systems management and eGovernment literature and individual studies all point to the role of governance and cross-organisational cooperation in successfully introducing eServices and citizens actual use of them.

With a specific focus on eGovernment and eGovernance maturity and stage models, the literature attempt to unearth the underlying reasons why countries with similar infrastructures and eService availability experience very different levels of online interaction with the public sector, and in particular whether existing stage models address governance and cooperation.

Unfortunately, the review highlight a number of gaps including: Focus on outcomes and actual use is missing; most lack a real understanding of core government service concepts; decision-making should not be considered an eGovernment maturity level; front-office service provision and back-office integration is mixed-up; none addresses governance directly; most models are merely restructure or adjust existing ones, and none address Gov3.0 as such.

Introduction

With demographic, economic and even climatic changes, the public sector and service delivery will to face change in the coming years. In this regard the potential of Information Communication Technology (ICT) as an enabler of public sector

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efficiency, effectiveness, modernization and transformation as long been recognized by academia, international organisations, governments and public administrations alike.

Gov3.0 is loosely defined as the capture next generation infrastructure, organizational structures, process and services required for the ICT-enabled transformation of the public sector (Janssen et al. 2009). Through openness, sharing, increased communication and cooperation the public sector, citizens, businesses and non-governmental stakeholders, the aim is for government to be more service-oriented, competent, and transparent, to proactively provide personalized and customized public services and generate new jobs in a creative manner by opening and sharing government-owned data to the public and encouraging communication and collaboration between government departments (Charalabidis 2015; Ministry of Interior Korea 2016).

As technology change, so do the skills, rules and regulations, costs, organisational models, service types and delivery channels required to transform government functions and public service delivery in light of Gov3.0 (Pollitt 2014; Frissen et al. 2007). Various case studies and international benchmarks show that individual authorities and governments have had vastly different degrees of success in utilizing the benefit of ICT in public administration, especially in light of rapid technological change. Still the failure of public administrations to successfully the full potential of ICT is not fully understood. This chapter will emphasis the need for strong governance and cross-governmental models of cooperation in order to harness ICT efficiently and effectively to transform public sector, service delivery and relationship between the public sector, business and citizens (EC 2012; OECD 2014; UNDESA 2014; Christine Leitner et al. 2003; Millard et al. 2007; Huijboom et al. 2009a).

Governance and cooperation has long been the focus of academic discourse, including: Public administration, in particular ICT enabled public sector reform (Brown and Magill 1994; Heeks 2005; Bannister and Connolly 2011; Pollitt and Bouckaert 2011; Cordella and Bonina 2012); information systems (IS) management (Brown and Magill 1994; Brown and Grant 2005; Klischewski and Scholl 2008; Ross et al. 2006; Weill 2004; Poeppelbuss et al. 2011), and; electronic government and governance research (i.e. eGovernment and eGovernance) (Heeks and Bailur 2007; Millard et al. 2008; Huijboom et al. 2009b). Several authors have highlighted failures to address specific issues including merely digitizing existing processes (Bannister 2001; Traunmüller and Wimmer 2003; de Bri and Bannister 2010), only addressing technology and supply (Janssen et al. 2012; Lips 2012; Meyerhoff Nielsen 2015), and ignoring the outcome and impact of ICT use (Cordella and Bonina 2012; Bannister 2007; Andersen and Henriksen 2006). The aim of this chapter is to identify and review the existing literature to assess the degree to which governance and cooperation is addressed – elements which are essential if public authorities are to realise the potential of ICT and Gov3.0.

First public administration, IS management and eGovernment literature will be explored. The aim is to identify the most relevant stream for a literature review (section "Background"). The literature review methodology (section "Methodology") and its findings are presented and discussed (sections "Stage and Governance Models" and "Review of Existing Stage Models"). The article concludes by recommending potential further research (sections "Conclusion" and "References").

Background

Research related to IT and technology use in public administration has progressed, and consequently the focus has shifted over time. Researchers such as Bannister (2007), Brown and Grant (2005), Heeks and Bailur (2007), Scholl (2009), Yildiz (2007), and ongoing research by Jukić et al. (2015), illustrate the changing focus of academic discourse. Initially the focus was on measuring and evaluating the maturity of ICT in public administration (from 1999/2000), followed by analysis of environmental and precondition issues (e.g. awareness, infrastructure, digital divide, etc.). The focus shifted to the evaluation of the availability of eGovernment services (i.e. supply, maturity level, etc.). Subsequently the research focus has moved to the actual use eGovernment solutions (i.e. demand usage, the gap between interest and use, the factors that affect the use, etc.) and the evaluation of eGovernment impacts (i.e. effectiveness, efficiency, equity, etc.). Of late, the innovative use of ICT in "SMART city" and decision making (e.g. eParticipation and eDemocracy) has been in vogue.

The term 'electronic government' was first coined in 1993 by the US National Performance Review, while the abbreviated form 'eGovernment' became prominent around 1997 (Heeks and Bailur 2007). That said, ICT has played a role in public sector service delivery since the middle of the twentieth century – as exemplified by Gammon's 1954 review article on the automatic handling of paper work in the public sector (Gammon 1954). In this chapter, eGovernment is defined as "the use of ICT and its application by government for the provision of information and public services to the people" (UNDESA 2014).

The definition of eGovernment stands in contrast to electronic governance (i.e. eGovernance), which encompass all processes of governing, whether undertaken by a government, market forces, a network (e.g. family, tribe, professional), formal or informal organization, a geographical territory or whether through laws, norms, power or language (UNDESA 2014). In other words, governance refers to what the 'governing bodies' responsible for eGovernment do to ensure success.

Governance and cooperation in relation to public sector service delivery matters for a number of reasons. An early estimate indicate that top performing companies generate up to 40% greater return than their competitors for the same investment in ICT (Weill 2004).

ICT Enabled Reform in Public Administration

ICT use in public administration is in the literature seen in two ways: As a tool to rationalize existing process or as an instrument to rethink the public sector, re-engineer processes and organisations (Cordella and Bonina 2012).

ICT as a tool to increase public sector performance and efficiency is closely associated the New Public Management (NPM) literature (Cordella and Bonina 2012; Cordella 2007; Demmke 2006). NPM brings the private sector corporate way of thinking to public administration, thus shifting the focus from effectiveness to efficiency through a new management culture and a focus on measurable results, often cost savings (Pollitt and Bouckaert 2011; Cordella and Bonina 2012; Self 2000).

The expectations of ICT enabled NPM reforms has nonetheless be questioned due to the complexity of organisational change and the political ramifications (Cordella and Bonina 2012; Peters and Pierre 1998; Iribarren et al. 2008). Authors like Bannister highlight the ability of ICT to transform the public sector, creating a Joined-up Government (JUG) where inter-governmental collaboration and coordination is supported by technology (Bannister 2001; de Bri and Bannister 2010).

In contrast to NPM, JUG (also known as collaborative public management or Gov 2.0), aim to reintegrate the public sector often fragmented by NPM reform (Cordella and Bonina 2012; Huijboom et al. 2009b; Christensen and Lægreid 2007; O'Leary et al. 2006). Lips' definition of Public Administration 2.0 (Lips 2012) goes as far as dropping the "e" in order to accommodate the complex and dynamic none-technical and contextual aspects of public administration reform.

What classical public administration literature seem to lack, is the merger NPM and JUG, i.e. the role governance in the introduction of ICT in public administrations in combination with measuring maturity levels and ICT take-up.

IS Management

Like the definitions of 'public administrative reform' and 'eGovernment', IS management and computer science literature offer a host of definitions and semantic variations (Brown and Grant 2005). A simple one states that, "IT governance represents the framework for decision rights and accountabilities to encourage a desirable behavior in the use of IT" (Weill 2004). This definition is in line with the chapters earlier definition of governance, i.e. what the 'governing bodies' responsible for eGovernment do to ensure success.

Two parallel streams of research emerge as dominant in the IT governance literature. One focus on forms of IT governance, the second on IT governance contingency analysis. IT governance forms is summarized by Brown and Grant (2005) in an attempt to define the various structural forms that governance models may take. Moving from a debate on the merits of centralized vs. decentralized design,

researchers have explored less rigid alternatives. These in turn are modelled on the operational realities of public sector organisations including vertical and horizontal integration, centralized, federal, decentralized organizational forms of government.

In contrast, IT governance contingency analysis unanimously agree that no universal best practice IT governance structure exist (Brown and Magill 1994; Brown and Grant 2005). Research therefore explore the basic structural options available, and attempt to unearth the logical and best options for different types of organisations. Similarly research focus on the contingencies which influence the adoption of a particular IT governance model, the role of actors, organisational maturity, size, structure, time frames, psychological climate, extra-organisational situations, resources, rank and location of responsible executives and steering committees, risk adversity, degree of centralisation etc. (Brown and Grant 2005).

For over 40 years, a recurring subtopic in this literature has been staged maturity models: models that morphed into capability maturity models (CMM) for assessing software development processes in the 1980s and, since 2002, the integration of product and service development, management, and acquisition (Poeppelbuss et al. 2011; Röglinger et al. 2012). While IT governance models, such as the US Federal Enterprise Architecture (Peters and Pierre 1998) and Chilean CMMI-inspired eGovernment maturity model and toolkit (Iribarren et al. 2008), address political and legal dimensions, most focus on business processes in single organisations, not the cross-organisational, national, or international ones of PA and eGovernment (Pöppelbuß and Röglinger 2011).What the IT governance literature lack, is the political and legal dimensions found in the public administration and eGovernment literature.

eGovernment and eGovernance

Two avenues of thinking dominates the eGovernment literature when it comes to ICT use in public sector. Both are similar to the public administration literature and sees technology as a tool to increase efficiency of existing processes, or as a way to radically transform the way government function (Cordella and Bonina 2012). This is mirror by authors like Lips (2012), Millard et al. (2007), Huijboom et al. (2009b), Traunmüller and Wimmer (2003) who see the role of ICT in public administration as changing over time. That is from eGovernment 1.0 where technology is seen as driving change in public administration and governance, to eGovernment 2.0 and 3.0 directly (Cordella and Bonina 2012; Cordella 2007; Demmke 2006). ICT is explicitly seen as an enabler of transformational change of government processes and its external relationships – including for SMART City concepts, transparency and democracy decision making (Huijboom et al. 2009b; Edelmann et al. 2008).

A stream within the eGovernment literature has since 1999 focused on the so-called stage and maturity models for use of ICT in public administration. Models have focused on mapping capabilities, maturity and progressive. Layne and Lee

(2001), West (2004), Moon (2002), Heeks (2015), Andersen and Henriksen (2006), Traunmüller and Wimmer (2003), Klievink and Janssen (2009) etc., have all argued in favour of the usefulness of stage models to guide policymakers and to stimulate the developments of capabilities needed by organisations to migrate from one stage to another – albeit from different perspectives.

A gap in the stage models and eGovernment literature is a clear link between the role governance and cooperation play in the successful implementation and subsequent use of ICT and eServices solutions. Similarly, most models merely focus on supply and technology, and less on outcomes or results.

Other Streams of Discourse

In addition to the academic discourse, relevant analysis and data is published by international organisations, including the European Union (EU), OECD (Organisation for Economic Co-operation and Development) and United Nations (UN). The 2014 EU digital scoreboard (EC 2014) and the UN eGovernment Survey (UNDESA 2014) highlight the rapid rise in Internet use (e.g. 72% in the EU) and the provision of high-speed broadband (e.g. 62% in the EU) over time. The EU, OECD and UN has traditionally focused on the availability of Internet and eServices, key technical enablers such as, data registries and unique identifiers and electronic identification (eID) (EC 2014). In their latest reports, the focus has shifted and now highlights effectiveness (OECD 2014), accountability (UNDESA 2014), and transparency and user-centricity (EC 2014) as critical enablers of eGovernment. Still, the mere introduction of technology do not guarantee success or additional value creation. The challenge of increasing the use of the digital service delivery channels and to increase public-sector efficiency and effectiveness persist. This is exemplified Japan (among others) where ICT infrastructure is well established, but actual use and efficiency gains have been limited or stagnant, due in part to fragmented organisational and project-governance structures (Meyerhoff Nielsen 2014, 2016a; Meyerhoff Nielsen and Igari 2012; Meyerhoff Nielsen and Mika 2014).

Research Stream and Potential Gaps

The technology and supply-side focus of most evaluations (incl. benchmarks, indexes and rankings) fail to provide an explanation for the discrepancies between the availability (i.e. supply) and the use (i.e. demand) of online public services (Meyerhoff Nielsen 2014; Meyerhoff Nielsen and Igari 2012). Wimmer (Traunmüller and Wimmer 2003), Leitner et al. (Christine Leitner et al. 2003), Huijboom et al. (Frissen et al. 2007; Huijboom et al. 2009b), Millard et al. (Millard et al. 2007; Millard 2013) and Bannister (de Bri and Bannister 2010) all highlight a lack of a

holistic approach, while Brown (Brown and Magill 1994) recommend an merger of the classical IT governance streams of thinking.

To illustrate the importance of governance models and outcomes is the discrepancy between Denmark and Japan online address changes (via the Internet). In Demark close to 80% of address changes are made online, while this is a scant 0.0002% in Japan (Meyerhoff Nielsen and Igari 2012; Igari 2014). Statistical analysis also fails to shed light on the underlying reasons why Danes use the Internet to interact with public administration (85%) more often than their Dutch and Swedish counterparts (79% and 78%, respectively) – although similar numbers of households in Denmark, the Netherlands, and Sweden pay for having access to the Internet (all in the 90+ percentile), and why their citizens have similar patterns of Internet use (also in the 90+ percentile) and private sector services such as online banking (all, 82%) (EC 2014; Meyerhoff Nielsen 2014, 2016b; Eurostat 2016).

In light of these challenges, the OECD on 15 July 2014 adopted a number of recommendations for public sector digitisation and eGovernment strategies (OECD 2014). The recommendations address the strategic direction of eGovernment, implementation, governance, and cooperation models. The OECD's recommendations are anchored in the realisation that, in order to successfully introduce ICT infrastructure and online services for improved public-sector efficiency and effectiveness, more than just a technological and supply-oriented approach is required (OECD 2014; O'Leary et al. 2006).

These practical examples hint also at potential limitations in current research. This chapter will therefore review the existing literature in an attempt to unearth the underlying reasons why countries with similar infrastructures and eService availability experience very different levels of online interaction with the public sector, and in particular whether existing stage models address governance and cooperation (sometimes known as maturity models).

Based on the initial exploration of current literature (above), an appropriate theoretical framework to assess and map the degree to which governance and cooperation models ensure the successful supply and use of online eServices, is found in the eGovernment stage model literature, and therefore be the focus of this chapters literature review.

Methodology

Framing the Literature Review

To address the two potential gaps identified in current eGovernment and governance research (in section "Background"), this chapter sets out two questions:

1. Does the literature address the degree to which, and in what way, governance and cooperation models ensure success supply and use (i.e. demand) of online citizen services?

2. Does the literature identify the success factors and are they mapped and developed into a universal governance model for successful digitisation of public sector service delivery (i.e. supply) and eService take-up (i.e. demand) by citizens?

To address the two research questions, a literature review is carried out. The focus of this review included the identification of existing models and their key differences (i.e. can the identified models and theories be mapped). What does current academic and practitioner debate focusing on? What is the current state-of-affairs? What are the clusters of theory, models and critique? What is the real life applicability of the theories and models?

Classic Literature Review

The literature review follow a classical pattern for systematic information retrieval as outlined by e.g. Roberts (1977) and the Walsh and Downe (2005) qualitative meta-synthesis procedure. The seven-step Walsh and Downe model is adapted to include 'berrypicking' (Bates 1989). The adapted methodology consists of the following six steps: Frame the exercise; Locate relevant studies; Decide what to include and a degree of 'berrypicking'; Appraise studies; Compare and contrast, and finally; Conclude.

Locating Relevant Studies, Models and Concepts

Primary and secondary key word searches were used. Primary key words were: eGovernment and stage, or model, or level, or tier, or development. Secondary key works included: eGovernment and/or maturity, governance, cooperation models, technology maturity, transformation, benchmarks, indexes. Other secondary key words were: Use, take-up, benefits, impact, output, efficiency, effectiveness, return of investment, eGovernment Readiness Index, eGovernment Benchmark.

To ensure that relevant literature and arguments were identified, Web of Science managed by Thomson Reuters, Scopus managed by Elsevier and EGRL - E-Government Reference Library (version 11.5) managed by the University of Washington, Information School online libraries were selected based on their relevance, scope and size to the literature review. Each of the reference libraries were searched and cross-referenced to ensure as complete and up-to-date picture of the academic discourse and the state-of-affairs as possible.

To ensure the quality of the literature review, the reference libraries was complimented with online research for number of secondary sources including key topic journals i.e.: GIQ – Government Information Quarterly by Elsevier, MIS Quarterly – Management Information Systems Quarterly MIS Quarterly by the Management Information Systems Research Center at the Carlson School of Management, University of Minnesota, and Information Polity by published by IOS Press.

Other complimentary sources are non-academic reports related to stage- and maturity models, benchmarks and rankings. Key publishers were the United Nations for the UN eGovernment Readiness Index, relevant surveys and country studies, the European Commission for the EU eGovernment benchmarking, studies, factsheets and good practices.

Deciding What to Include

To frame and define the parameters of the literature review, a publication had to be published in English, in the proceedings of an academic conference or in an academic journal (preferably GIQ, MISQ or Information Polity) or a recognized international body (mainly UN, EU or OECD), been subject to peer review (exception possible if published by the UN, EU or OECD), a minimum seven pages (or approx. 3700 words) in length including references, after 1 January 1995.

Where appropriate a second stage of screening, or 'berrypicking' as outlined by Bates (EC 2014), is applied. The robustness of the theoretic models identified, secondary sources and key words is of particular relevance in this regard.

Appraise Studies

As eGovernment is maturing as a distinct field of study, and Gov3.0 is only just emerging as a concept, it is important to weed out low quality studies and models in the appraisal stage of the literature review. Studies and models which highlight the same points are identified based on their relevance to the research frame and questions, the models and studies robustness and contribution to the literature. Depending on the finding the rigor of the theoretical foundation on which the model is founded is applied with various degree, i.e. 'berrypicking' (Bates 1989).

Models are compared and contracted in a mapping exercise (in section "Stage and Governance Models") to identify homogeneity or heterogeneity between the various models, their strengths and weaknesses. The purpose is to identify potential areas of future research in the in the area of stage, cooperation and governance models for successful introduction and use of eServices.

Stage and Governance Models

In light of the potential research gaps identified in section "Background", an appropriate theoretical framework to assess and map the degree to which governance and cooperation models ensure the successful supply and use of online eServices, may be found in the eGovernment stage models literature and the IT governance models,

developed in the field of IS management and computer science. This section therefore outlines the characteristics and focus of number of key eGovernment stage and maturity models.

Stage Models Identified and Described

Layne and Lee refer to the experiences of eGovernment as chaotic and unmanageable, arguing for the division of development into distinguishable stages (Layne and Lee 2001). To this effect eGovernment research has largely focused on stage, or maturity, models.

Multiple stage models has been suggested by researchers, consultants, national authorities and international organisations. In this context academics differentiate between three types of stage-models (Fath-Allah et al. 2014; Persson and Goldkuhl 2005):

- Governmental models: Models developed by governments, consultants and academics to help authorities identify and improve their level of maturity (generally using predefined models and toolkits).
- Holistic approach models: Models designed to assist authorities (generally predefined models, toolkits and indicators) in project implementation and to determine if the project will be successful or not.
- Evolutionary eGovernment maturity models: Models which focus on sequential evolutionary steps, for instance from immature to mature eGovernment with improved quality (often from an academic perspective).

The primary focus of this review is on governmental and evolutionary stage models, since the holistic maturity model approach focuses on project implementation and organisational capabilities, and particularly relevant in relation to IS management and CMM literature (Ross et al. 2006; Poeppelbuss et al. 2011; Persson and Goldkuhl 2005).

Using the methodology outlined in section "Methodology", 42 stage models are identified. The following subsections clusters the various models based on their respective characteristics.

ANAO – Australian National Audit Office's (ANAO 1999) 1999, four-stage maturity model was introduced to categorize and evaluate process to guide agencies in their decision as to what services could and should provide. The model is national in character and takes an abductive-deductive approach to eGovernment maturity. The model is developed based on experiences in Australia. The levels of maturity are: Publishing and information; Interaction; Transaction of secure information (incl. login), and; Sharing information with other agencies (incl. business and citizens).

Gartner Group (Baum and Di Maio 2000) published a four state model in 2000. It is one of the earliest eGovernment maturity models not emerging out of a national context. The Gartner model focus is on supply and technology with a degree of

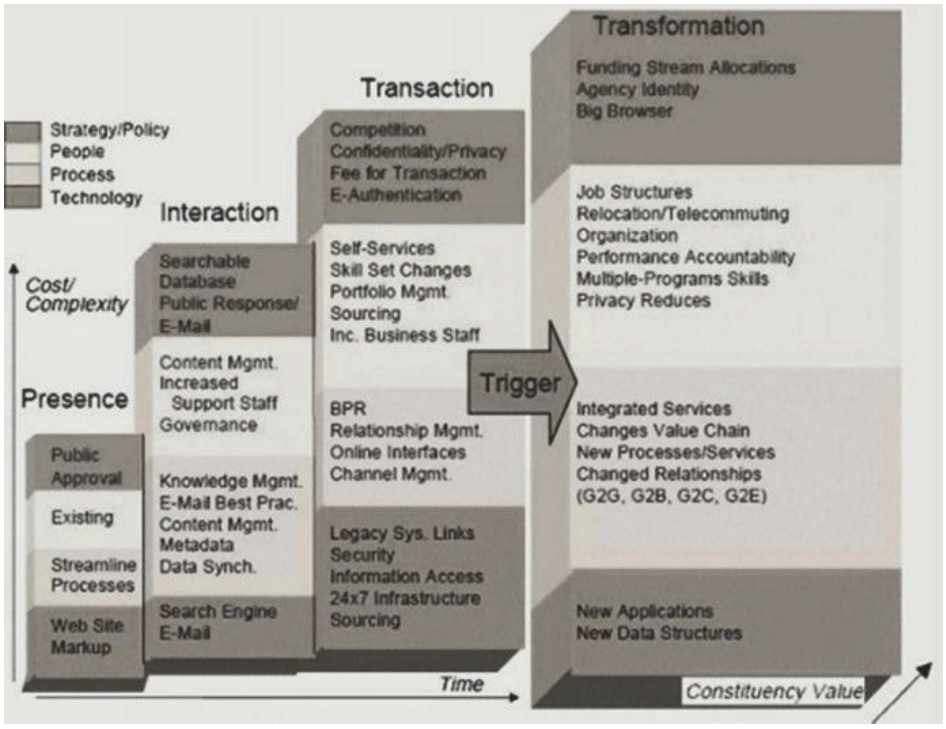

Fig. 1 Gartner four-stage model (Baum and Di Maio 2000)

integration. The model is developed by a consultancy and takes a deductive approach to eGovernment maturity. The stages of maturity are (see Fig. 1): Information incl. information, websites with static content; Interaction such as e-mails and downloadable forms; Transaction incl. integrated websites with transaction (i.e. eService), and; Transformation, i.e. seamlessly integrated websites (i.e. a degree of vertical and horizontal integration).

SAFAD (Swedish Agency for Administrative Development / Statskontoret) (Statskontoret 2000) in 2000 published a four-stage maturity model inspired by the Australian National Audit Office model and Swedish experiences. It was introduced to categorise and evaluate process to guide agencies in their decision as to what services could and should provide. The model is national in character and takes an abductive-deductive approach to eGovernment maturity. The stages of maturity are (see Fig. 2): Websites i.e. packages of information, Interactive websites, Web and communication that is information plus entry and retrival of personal information, and Website and network functions.

Deloitte Research (Deloitte and Touche 2001)¨in 2001 proposed a model focusing on supply, technology and organizational integration. It adds a dimension of engagement and co-creation (indirectly by none-governmental stakeholders). The model is developed by a consultancy and takes a deductive approach to eGovernment maturity. The model has been applied to Australia, Canada, New Zealand, UK

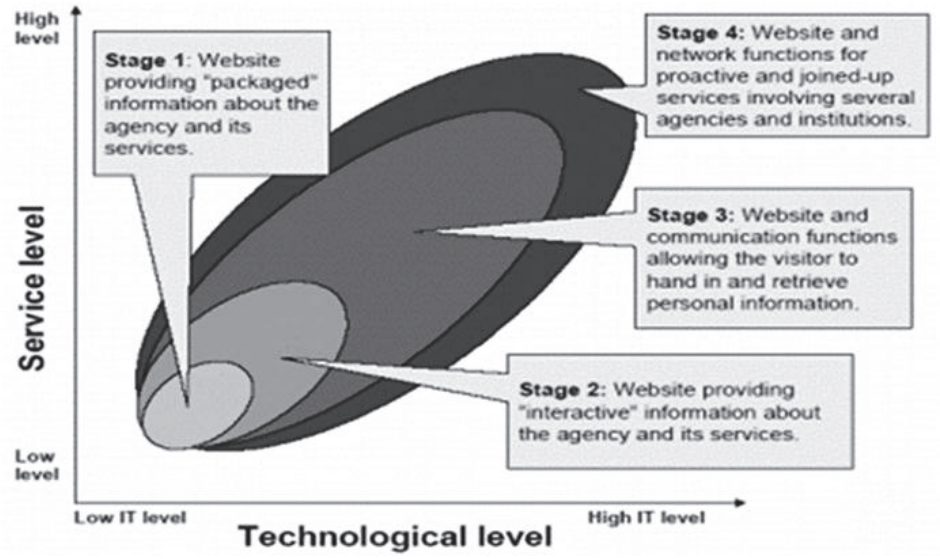

Fig. 2 SAFAD four-stage maturity model (Statskontoret 2000)

and USA. The maturity levels are: Information publishing/dissemination: Websites with static information;

"Official" two-way transaction: electronic identity management (eID) and eServices; Multi-purpose portals: portals (i.e. a degree of vertical and horizontal integration); Portal personalization: basic personalization and life-events; Clustering of common services (i.e. increased personalization and life-event, increase integration), and; Fully integration and enterprise transaction: Life-events, full personalization, user-centric and engagement in service choice and delivery.

Hiller and Bélanger's (2001) 2001, five-stage maturity models focus on supply, technology and organisational integration and some aspects of participation in a democratic sense. It is also one of the most sited models to date. It is a scientific model, with an inductive approach to eGovernment maturity. The maturity levels are: Web presence incl. technological leap-frogging, websites with static information); Interaction such as simple interaction, e-mail and downloadable forms; Transaction i.e. eServices; Transformation/integration incl. back office automation and digitization of processes, aspects of vertical and horizontal integration, and; Participation covering transparency, release of data.

Howard (2001), in 2011, propose a simple three-stage maturity model. It is a scientific model, with an inductive approach to eGovernment maturity and present it as a classical curve consisting of technical sophistication and benefits. The maturity levels are (see Fig. 3): Publish (i.e. static information); Interact (i.e. information increasingly updated, downloadable forms etc.), and; Transact (i.e. eServices).

Layne and Lee's (2001) 2001 maturity model is the most cited to date. The focus is on technology, supply and organizational integration. It is a scientific model, which takes an abductive approach to eGovernment maturity. The model is devel-

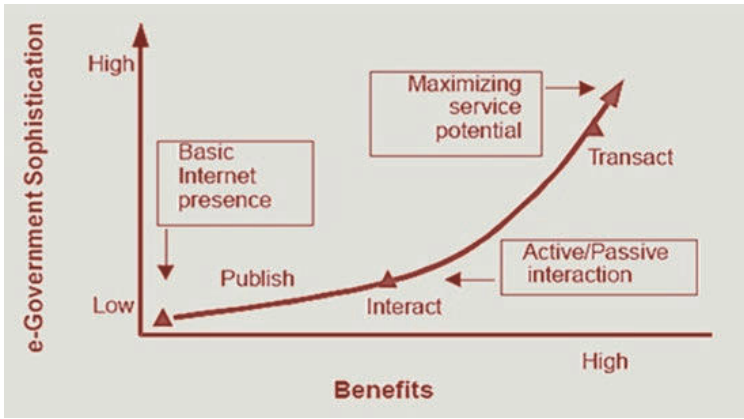

Fig. 3 Howard's three-stage eGovernment maturity curve (Howard 2001)

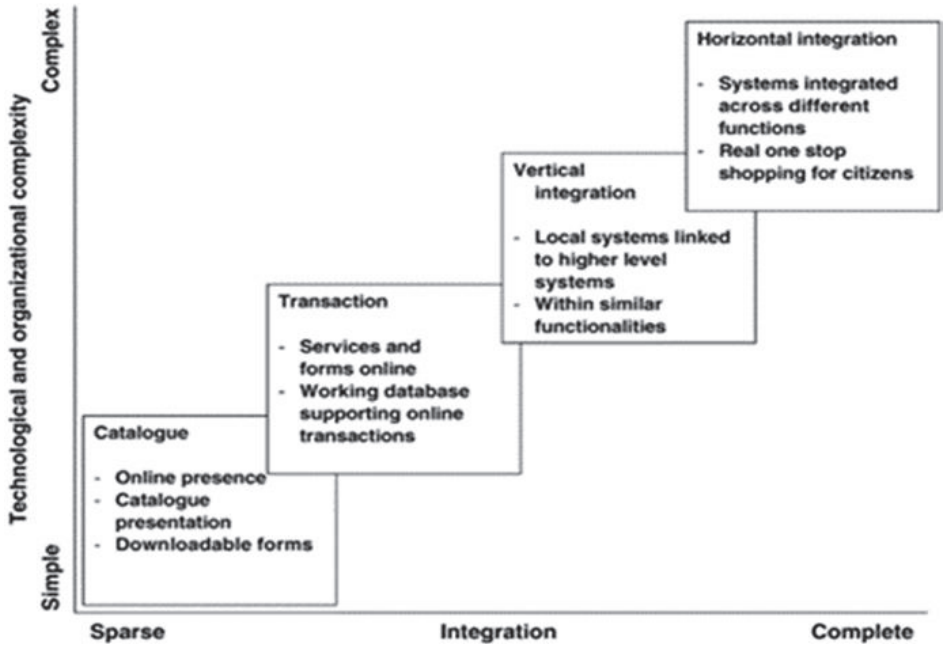

Fig. 4 Layne and Lee model four-stage maturity model (Layne and Lee 2001)

oped based on observations in the USA and earlier models. The four-stages of maturity are defined as (see Fig. 4): Catalogue i.e. online presence (i.e. websites with static information and downloadable forms); Transactional incl. service and forms (i.e. eServices); Vertical integration, that is local system integration, and; Horizontal integration i.e. integration across function (i.e. life-events and personalisation).

United Nation's (UNDESA 2014, 2008, 2010, 2012; Ronaghan 2002) is best known for its biannual UN eGovernment Readiness Index. The model has been in

use since 2001 when the first Index was first published. It covers pre-conditions such as supply, technology and integration. The original focused has been on the five-stages of maturity. The UN publishes the bi-annual eGovernment Readiness Index, but has in the last few years refocused the models to include additional aspects of engagement and transparency (e.g. the UN eParticipation Index). The model is "international" in character and takes an abductive-deductive approach to eGovernment maturity. The model consists of a biannual ranking of 193 countries. The model has a pre-condition stage, which focus on at network preparedness, access to PCs, the Internet and literacy and digital competences (i.e. TII Index). The maturity levels are (see Fig. 5): Emerging presence such as basic websites with static information; Enhanced presence e.g. emerging portals (i.e. a degree of vertical and horizontal integration), interactivity, and customer services (i.e. eServices); Interactive such as two-way interactivity (i.e. eServices and communication), searchable intranet; Transactional i.e. eServices, and; Seamless incl. sully networked government (i.e. horizontal and vertical integration).

Wescott's (2001) 2001 model consist of six stages. It is a scientific model, with an abductive approach to eGovenment maturity. It has been developed based on

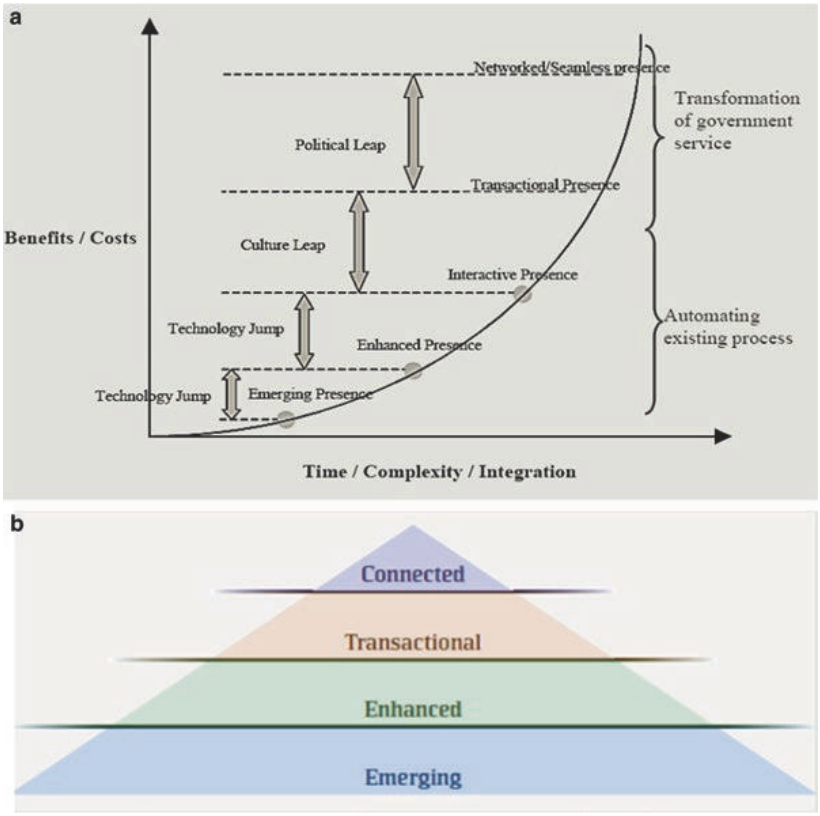

Fig. 5 (**a**) The original four-stage UN model, 2002 (Ronaghan 2002). (**b**) The updated version of the UN model, 2012 (UNDESA 2012)

observations in the Asia-Pacific. The maturity levels are: Setting up an email system and internal network e.g. feature e-mail systems to improve information sharing, coordination and feedback; Enabling inter-organisational and public access to information e.g. information is department centric, shared between organisations and can be accessed by the public over the Internet; Two-way communication such as basic eServices and citizens can make suggestions using emails or ask questions in forums and receive answers. Exchange of value e.g. eService features applications such as tax assessments and license renewals. At this stage, the citizen can make secure payments online; Digital democracy incl. focus is on empowering the civil society (e.g. increasing awareness of government corruption) and allowing citizens to vote and express their opinions and feedback, and; Joined-up government incl. vertical and horizontal integration allowing for citizens to execute services without knowing which government agency is responsible for.

Chandler and Emanuel (2002) in 2002 proposed a four-stage model. It is a scientific model, with an indicative approach to eGovernment maturity. The maturity levels are: Information i.e. online information about government services and policies; Interaction such as basic level of interaction between governments and citizens such as email systems; Transaction i.e. features eServices, and; Integration e.g. features integrated services across various departments and agencies.

European Union (2012) has since 2002 used a eGovernment benchmark model similar to the UN. The focus is on supply, technology and integration and initially included five-stages of maturity. The European Commission publishes its eGovernment benchmark yearly, but has since 2010 started including additional biannual focus areas, and has moved from benchmarking services to life-events, user engagement, access to personalized data and user-rating – through mystery shoppers and surveys. The model is "international" in character and takes an abductive-deductive approach to eGovernment maturity. The model is developed with inspiration from the SAFAD model (Statskontoret 2000) and experiences in the EU+ member states. The model forms the basis of the EU's annual eGovernment Benchmarks and Surveys. A pre-condition stage looking at PC and Internet accessibility as well as digital literacy compliments its five stages (see Fig. 6): Emerging presence i.e. basic websites with static information; Enhanced presence e.g. emerging portals (i.e. a degree of vertical and horizontal integration), interactivity, and customer services (i.e. eServices); Interactive, that is two-way interactivity (i.e. eServices and communication), searchable intranet; Transactional i.e. eServices, and; Seamless such as fully networked government (i.e. horizontal and vertical integration).

Hodgkingson (2002), in 2002, present a two phased, five-stage model, focusing learning cycles and an s-shaped curve for learning (see Fig. 7). The model focus the rate of technology diffusion in government, service impact and technical aspects such as interoperability before data exchange and vertical and horizontal integration is possible. It is inspired by diffusion of innovation (DOI) and innovation diffusion theory (IDT), technology acceptance (TAM) and IS management models. The stages are: Government online i.e. initiation of idea generation, analysis and pilot implementation and contagion such as wider adoption of technology and benefits of ICT, business needs, decentralization of strategy and resources; eGovernment i.e.

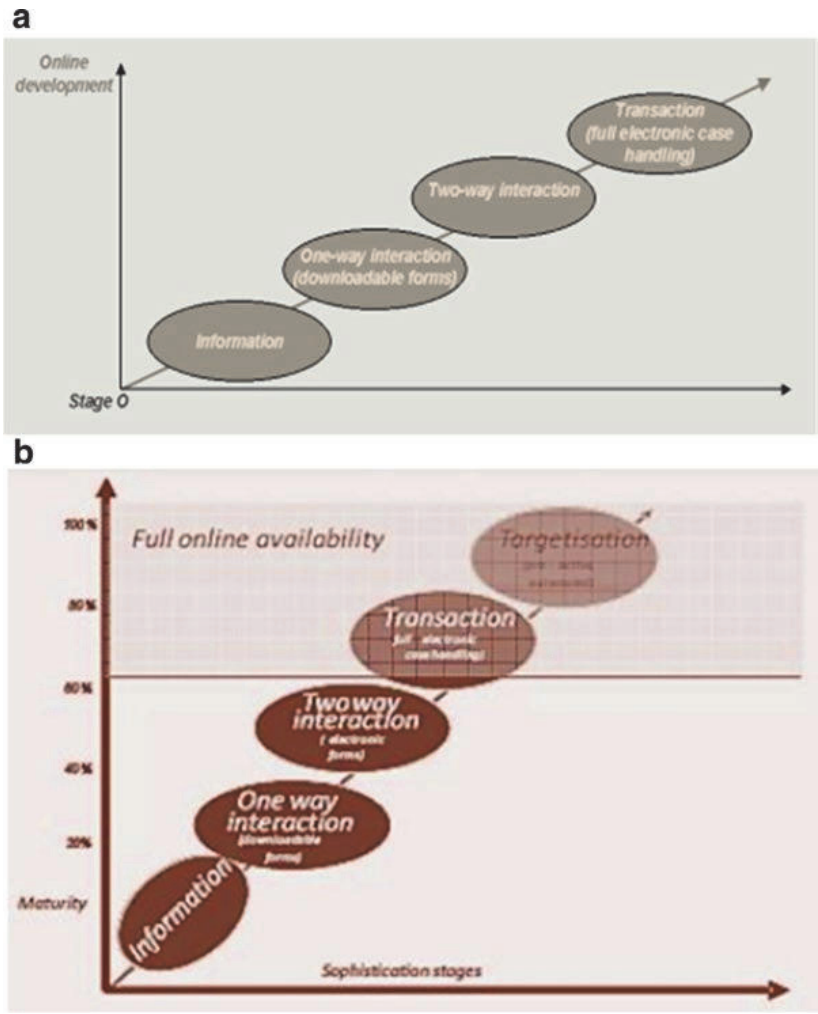

Fig. 6 (**a**) The original four-stage EU model, 2002. (**b**) The updated five-stage EU model, 2009 (EC 2012)

control (i.e. re-focus on cost, efficiency and quality, re-centalisation of some strategies and control), interoperability, and data management.

Moon's (2002) 2002 five-stage model by M.J. Moon focus on supply, technology and organisational integration and some aspects of participation in a democratic sense. It is very similar to the 2001 model proposed by Hiller and Belanger (2001). It is a scientific model, with an abductive approach to eGovernment maturity. It was developed based on observations and data from 2000 US municipality websites. The maturity levels are: Web presence i.e. technological leap-frogging, websites with static information); Interaction such as simple interaction, e-mail and downloadable forms; Transaction i.e. eServices; Transformation/integration such as back office automation and digitization of processes with aspects of vertical and horizontal integration, and; Participation for transparency and release of data.

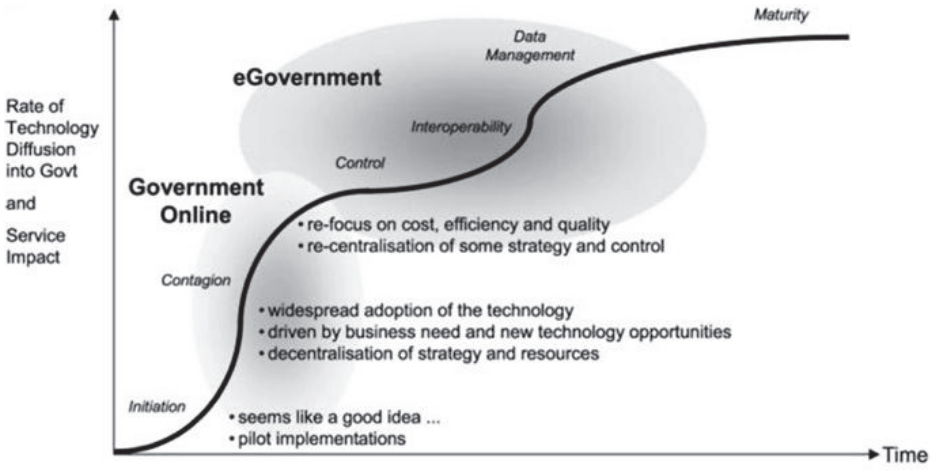

Fig. 7 Hodgkingson's five-stage maturity model and learning curve (Hodgkinson 2002)

Netchaeva's (2002) 2002 five-stage model for eGovernment and eDemocracy does not name the individual maturity levels. It is a scientific model, with an inductive approach to eGovernment maturity, and focus on the following aspects: Scattered information e.g. websites with department information; e-mails and FAQ; Other online services such as features forums and opinion surveys; eGovernment portal incl. eServices such as license renewals and payment of fines, portals and one-stop-shops, and; Possible democracy e.g. citizens can vote, contribute in online discussions and make comments on policy and legislation proposals.

UKNAO – UK National Audit Office (NAO 2002) in 2002 presented a report to the House of Commons, in which a five-state maturity model was introduced. The model is "national" in character and takes an abductive-deductive approach to eGovernment maturity. The model is developed based on experiences in UK. The maturity levels are: Basic site with limited information available online, mainly information about authorities; Electronic publishing incl. increasing number of website and more content; ePublishing e.g. use of personalization options and customizable search tools, some forms can be submitted online and others can be downloaded and increasing use of e-mails and the timely responses, alerts about new content is an offered; Transactional incl. secure eService transactions, and; Joined-up eGovernance: featuring one-stop-shops and joined-up governments through vertical and horizontal integration.

World Bank (Toasaki 2003; InfoDev, C.f.D.a.T. 2002) published a three-stage model in 2002. The model is "international" in character and takes a deductive approach to eGovernment maturity. The model is developed as part of the World Bank's Center for Democracy and Technology eGovernment handbook for developing countries. The maturity levels are (see Fig. 8): Publish online information such as rules, regulations, documents and forms; Interact, with users providing feedback and submit comments on legislative or policy proposals, and; Transact, i.e. secure eService transactions.

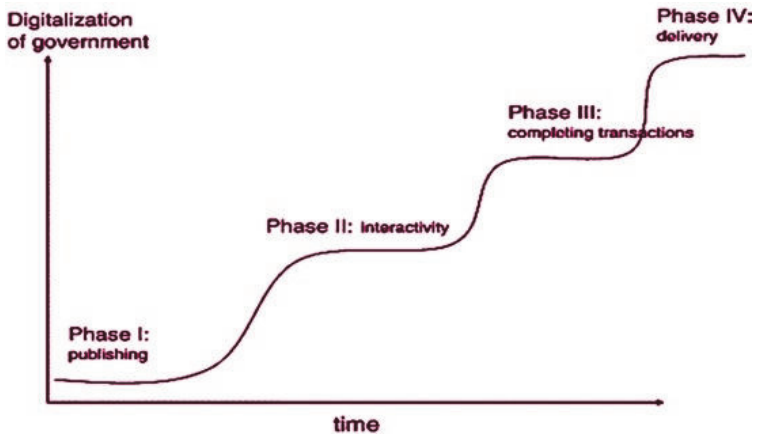

Fig. 8 World Bank four-stage maturity model (Toasaki 2003)

Accenture (Rohleder and Jupp 2003) in 2003 published a five-stage model. The model is developed by a consultancy and takes a deductive approach to eGovernment maturity. The model has been applied to Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Malaysia, Mexico, the Netherlands, Norway, Portugal, Singapore, South Africa, Spain, the UK and USA. Based on the model Accenture publish an annual eGovernment Ranking of selected countries. The model consisting of the following maturity levels: Online presence with information published online; Basic capability i.e. security and certification is developed and the online presence is broadened; Service availability with eServices increasingly available on portal(s) and features of cross agency cooperation and services increasingly designed to meet customer needs; Mature delivery with eServices clustered with clear ownership and authority – CIO (Chief Information Officer) or central agency the involvement of customer in the process of eGovernment and the services are marketed; Service transformation i.e. improved customer service delivery is the objective and multi-channel integration is common.

Koh and Prybutok (2003) in 2003 presented a three-element model (see Fig. 9). The model is scientific and takes a inductive approach to eGovernment maturity. The model focus on internal and external factors and three stakeholder groups i.e. employees in public authorities, suppliers (i.e. IT vendors or IT departments) and customers (i.e. citizens and businesses). Visualised as circles of there are overlaps between the three elements thus providing a degree of granularity with a degree of inspiration from the IS management and computer science literature. The elements are: Informational i.e. online information; Transactional i.e. online transactions, and; Operational i.e. operational, vertical and horizontal integration.

Reddick's (2004) 2004, two-stage model, is one of the most simple maturity models identified. It is a scientific model, with an abductive approach to eGovernment maturity. The model is developed based on observations in the USA, The

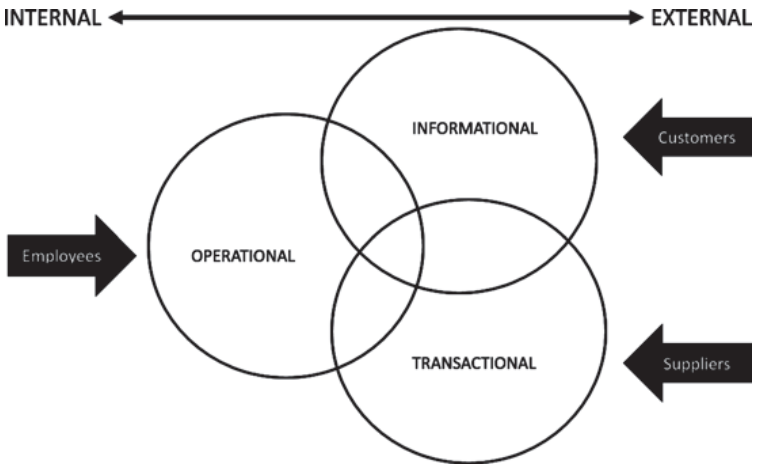

Fig. 9 Koh and Prybotok's three-stage and users of internet maturity model (Koh and Prybutok 2003)

maturity levels are: Cataloguing online information about the government and its activities, and; Transactions incl. eServices and one-stop-shops.

Waseda (Obi 2014, 2012, 2015) first published the Waseda model and its annual benchmarks for selected countries in 2004. The model is "international" in character and takes an abductive-deductive approach to eGovernment maturity. The model is used for an annual eGovernment ranking list for an increasing number of countries. The model differs somewhat from other stage models as it does not define distinct levels of maturity. It covers managerial and organisational aspects also seen in CMM/CMMI models and the IS management literature. The focus is on qualitative and quantitative indicators including: Network preparedness and infrastructure; Management optimization and efficiency; Online presence of information, services, national portals and websites; Governance incl. cooperation and promotion; eParticipation and digital inclusion; Open government, and; Cyber security. The indicators can be grouped into four-stages, that is: Networked preparedness and infrastructure; Online services; Management optimization, and; eParticipation.

West (2004) first published the four-stages model in 2004. It is a scientific model, with an abductive-deductive approach to eGovernment maturity. The model is developed based on observations and data from 1813 and 1680 US municipality websites model in 2000 and 2001. The West Index on US municipalities and a number of countries is based on the model. The maturity levels are: Bill-board i.e. websites as billboards mainly used for posting information; Partial-service-delivery with the ability to search for data via search engines with some eServices available; Portals containing all information and eServices (i.e. a one-stop-shop), and; Interactive democracy incl. ortals offers personal and proactive online service, utilise push technology and feedback forms.

Windley's (2002) 2002, four-stage model. It is a scientific model, which takes a deductive approach to eGovernment maturity. It is developed based on observations

from the US Utah.gov site and consists of the following maturity levels: Simple website with static pages with downloadable forms; Online government featuring interaction mechanisms such as e-mails, online forms, help and FAQs; Integrated government incl. end-to-end eService transactions, but also emerging internal integration as information is shared between departments, and; Transformed government: Customer centric eServices organized according to user needs and segmented according to population groups and life events. Vertical and horizontal integration is also a feature.

Davison et al. (2005) in 2005 presents a four-element model combining the insights of the strategy and maturity alignment models form the IS management and computer science literature (see Fig. 10). The model focus on internal and external factors in both the government (i.e. the public sector in general) and eGovernment domain (i.e. ICT within the public sector). Rather than looking at the supply-side issues related to digitization of service delivery and ICT enabled reform Davison et al. focus on the key elements enabling the successful use of ICT. The models cover eGovernment services (i.e. information and transaction), processes (i.e. vertical and horizontal integration) and transformation within the four elements of: Government strategy with choices pertaining to positioning of government and business strategies; Government infrastructure and processes incl. choices pertaining to internal arrangements and configurations supporting authorities chosen position including public sector culture; eGovernment strategy incl. choices pertaining to IT scope, systemic capabilities and IT governance, and; eGovernment infrastructure and processes e.g. internal arrangements and configurations determining data, applications and technology infrastructure used to deliver eGovernment services.

Siau and Long's (2005) 2005 five-stage maturity models focus on supply, technology and organisational integration and some aspects of participation in a democratic sense. It is a scientific model, with an inductive approach to eGovernment maturity. It differs from the Moon (2002), Hiller and Belanger (2001) models by including engagement and political decision making to the fifth stage in the form of

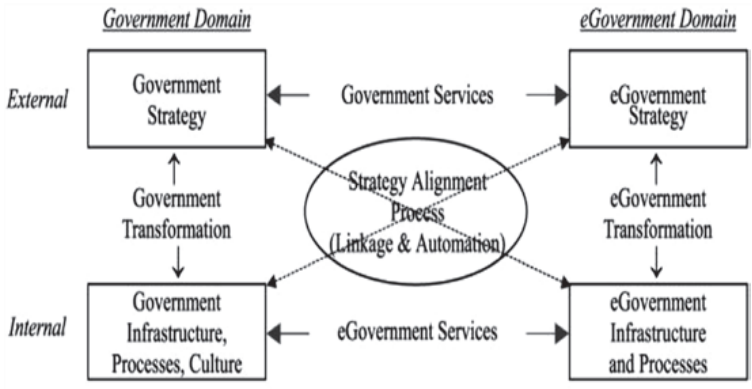

Fig. 10 Davison's et al. four stage strategy and maturity model (Davison et al. 2005)

a "eDemocracy stage". The maturity levels are: Web presence incl. technological leap-frogging, websites with static information); Interaction e.g. simple interaction, e-mail and downloadable forms; Transaction i.e. eServices; Transformation/integration such as back office automation and digitization of processes and aspects of vertical and horizontal integration, and; eDemocracy incl. engagement, political decision making, transparency, release of data.

Persson and Goldkuhl (2005) in 2005 evaluates a number of existing models and propose a two-stage model from a computer science perspective. The maturity levels are: Integration of services with a focus on public services, directed services, concentrated services and portals, and; Integration in services incl. elements such as the integration of services and agencies, transparency in processes of independent processes, database access in information gathering, information or decision provision requirements and joint information services.

Andersen and Henriksen's (2006) 2006 Public Sector Process Rebuilding Model (PPR) builds on Layne and Lee four-stage maturity model (Layne and Lee 2001). It is a scientific model, with an abductive-deductive approach to eGovernment maturity. It is developed based on observations and data from 110 central government sites in Denmark. The PPR model focus on supply, organizational integration, processes and differs from other models by emphasising user-centricity rather than technological aspects. Four-stages of maturity, of which the first two stages comprise the four-stages proposed in the Layne and Lee model (see Fig. 11): Cultivation e.g. websites with static information, downloadable forms, vertical and horizontal integration; Extension such as eServices, basic personalization and life-events and a focus on data ownership; Maturity of eServices, none-Internet interphases,

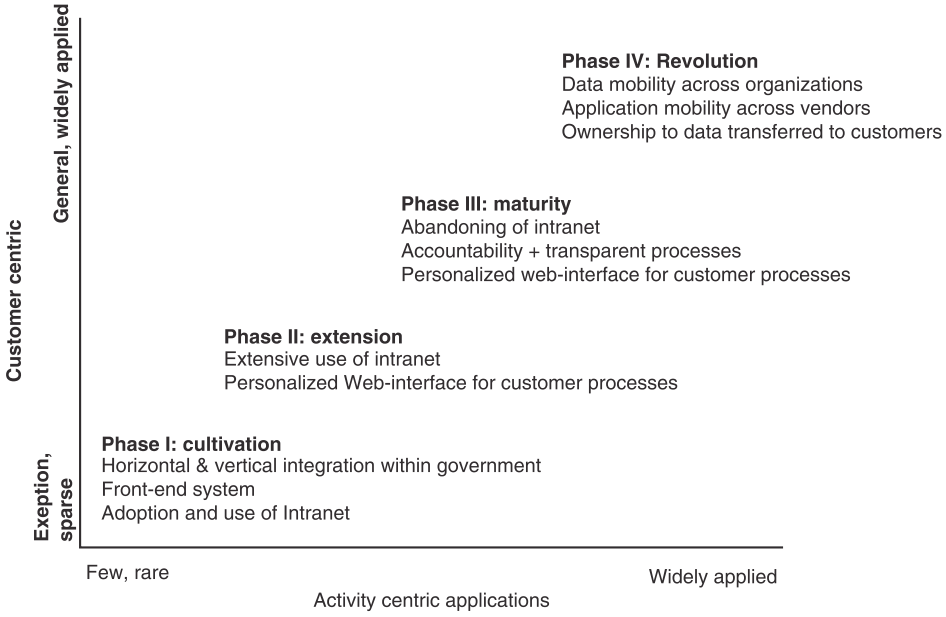

Fig. 11 Andersen and Henriksen PPR model (Andersen and Henriksen 2006)

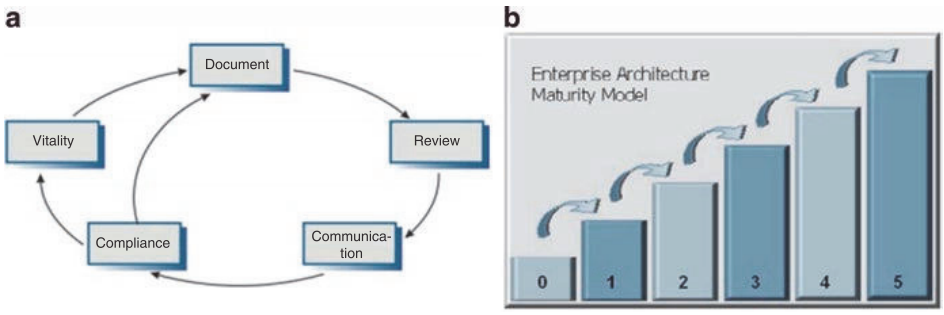

Fig. 12 (**a**) eGOV-MM's three dimension and interrelated elements (NASCIO, N.A.o.S.C.I.O. 2006). (**b**) eGOV-MM's domain level and key domain areas (NASCIO, N.A.o.S.C.I.O. 2006)

increased personalization, user-centricity and outcome based organisations with economics of scale being sought, data ownership more fluid, mobility of data and open data based infrastructure; Revolution i.e. seamless organizational structures, fully personal and outcome based service delivery, with data ownership and focus fully transferred to the end-user.

National Association of State Chief Information Officers' (NASCIO) (NASCIO, N.A.o.S.C.I.O. 2006) 2006 Enterprise Architecture Maturity Model and toolkit, is not a eGoverment matority model par say, but it is exemplifies a lot of the IS management CMM/CMMI model thinking which has inspired many future models. The model and toolkit is national in nature, takes an inductive-deductive approach to eGovernment, and is developed in corporation with CIO's in the USA. The aim of the model is to introduce a cyclic process and approach to IT development in single organisations. Based on documentation, review, compliance, communication, and vitality elements framework and procedures must be reviewed and updated to properly reflect environmental changes (see Fig. 12). The model has six-levels of maturity and each consist of a number of eight categories of factors. The stages are: Level 0 No programme; Level 1 Informal program; Level 2 Repeatable program; Level 3 Well-defined program; Level 4 Managed program, and; Level 5 Continuously improving vital program. The categories are: Administration i.e. governance roles and responsibilities; Planning incl. EA program road map and implementation plan; Framework e.g. processes and templates used for EA; Blueprint i.e. a collection of the actual standards and specifications; Communication such as education and distribution of EA and Blueprint detail; Compliance ensuring adherence to published standards, processes and other EA elements, and the processes to document and track variances from those standards; Integration of touch-points of management processes to the EA, and; Involvement and support of the EA Program throughout the organisation.

Cisco (2007), the IT and consultancy firm, in 2007 published a three-stages. It is a scientific model, with an abductive approach to eGovernment maturity. The maturity levels are: Information interaction featuring departmental websites, legislative posting, public notices, online forms, webcasting and personalized portals; Transaction efficiency i.e. eServices and portals including electronic payments like

online taxes and eProcurement, and; Transformation citizen centric, i.e. consolidated and shared administrative services at this stage are across various government jurisdictions.

Almazan and Gil-Garcia's (Almazan and Gil-Garcia 2008; Luna et al. 2013) six-stage model published in 2008 (presence, information, interaction, transaction, integration and participation). It was updated in 2013 by merging the initial two stages information based stages (i.e. presence and information) and adjusting the remaining four stages. The 2013 model consists of five-stages and 172 indicators, which aim to highlight the performance and efficiency of portals by including supply and actual use in relation to the online population – thus, indirectly including preconditions (Luna et al. 2013). It is a scientific model, with an abductive approach to eGovernment maturity. It has been developed based on observations and data from 32 Mexican state portals and includes ranking (in 2013). The 2013 levels of maturity are: Information Online information, static or updated; Interaction e.g. downloadable forms, communicate with the government via e-mail and forums; Transaction such as secure eService transactions and payment options via portals; Integration incl. one-stop-shops/portals, vertical and horizontal integration, and; Political participation offering users voting and participation in opinion polls, surveys and public forums.

Chan et al. (2008) in 2008 proposed a model focusing on supply, technology and organizational integration. It adds none-governmental stakeholders to the mix. It is a scientific model, with an abductive approach to eGovernment maturity. The model is developed based on observations and data from regional government in China. The five-stages of maturity are: Publish websites with static information; Interact i.e. downloadable forms; Transact though eServices; Integrate though vertical and horizontal integration of service providing agencies, and; Tri-party integration i.e. integration of public, private and stakeholder organisations.

Iribarren et al. (2008) proposed an IT focused eGovernment Maturity Model (eGov-MM) based on four domain levels, in 2008. It is a multi-dimensional model and assessment tool in the form of a capability maturity framework to ensure continued measurement and control. It is a national model developed for the Chilean government and borrows from experiences in the UK, US, Australia, Canada, Sweden, South Korea and others. It distinguish between maturity and capabilities and is inspired by the IS management's US CMMI and EA models (NASCIO, N.A.o.S.C.I.O. 2006), ISO/IEC 15504 in Europe and supports Wimmers holistic view (Traunmüller and Wimmer 2003; Iribarren et al. 2008). The domain levels on effectiveness, efficiency, confidentiality, integrity, availability, compliance, manageability on one axis and IT resources like applications, data, infrastructure and facilities on the other (see Fig. 13). The four domain levels are: eStrategy; IT governance; Process management; People and organisation capabilities.

Shahkooh et al. (2008) in 2008 proposed a five-stage model. It is a scientific model, which takes an abductive approach to eGovernment maturity, proposing the following maturity levels: Online presence i.e. online information; Interaction with citizens interacting with governments through e-mail to officials and downloading forms; Transaction though secure eService transactions like payments and tax fill-

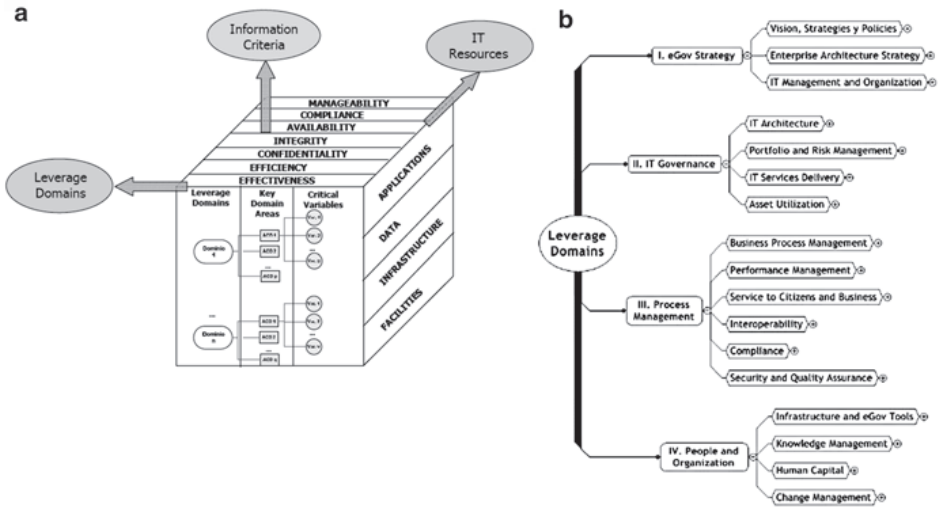

Fig. 13 (**a**) eGOV-MM's three dimension and interrelated elements (Iribarren et al. 2008). (**b**) eGOV-MM's domain level and key domain areas (Iribarren et al. 2008)

ing; Fully integrated and transformed eGovernment with services organized as a single point of contact such as portals, and; Digital democracy featuring online voting, public forums and opinion surveys.

Kim and Grant (2010) in 2010 published a five-stage model. It is a scientific model, with an inductive approach to eGovernment maturity with the following maturity levels: Web presence featuring simple and limited information online; Interaction focus on search engines and downloadable forms; Transaction incl. online transactions with the possibility of electronic payments; Integration i.e. horizontal and vertical integration and performance measurements using statistical techniques, and; Continuous improvement featuring political activities and a focus on continuous improvements and performance.

Kalambokis et al. (2011) focus on data in their 2011 Open Government Data (OGD) Stage Model. Like Andersen and Henriksen (2006) focus on value creation in light of organisational and technical complexity (see Fig. 14). Other sources includes Deloitte and Touche (2001), EU (2012), Layne and Lee (2001), Siau and Long (2005) and West (2004). It is a scientific model, with an inductive approach to eGovernment maturity and open data use – and indirectly on eServices. The maturity levels presented are: Aggregation of government data; Integration of government data; Integration of government data and non-government formal data; Integration of government data with non-government formal and social data.

Shareef et al. (2011) in 2011 present the eGovernment Adoption Model (GAM) (see Fig. 15) focus on five overaching categories, 11 sub-categories and 73 factors which influences citizens adoption of eGovermment. It focus on attitudes, digital literacy, assurance, adherence and adaptability to use. It is a scientific model with an inductive approach to eGovernment. It is based technology adoption model (TAM), diffusion of innovation (DOI) and planned behavior theory (TPB). Previous models have been considered, and empirical work has been carried out in Canada. The five

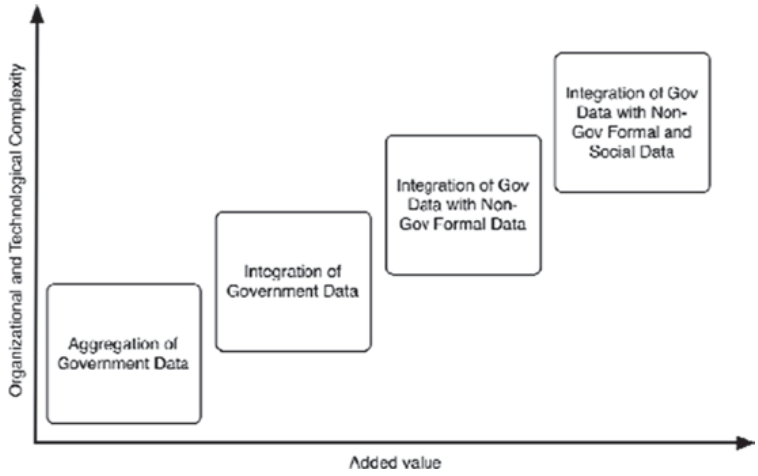

Fig. 14 OGD Maturity Model (Kalampokis et al. 2011)

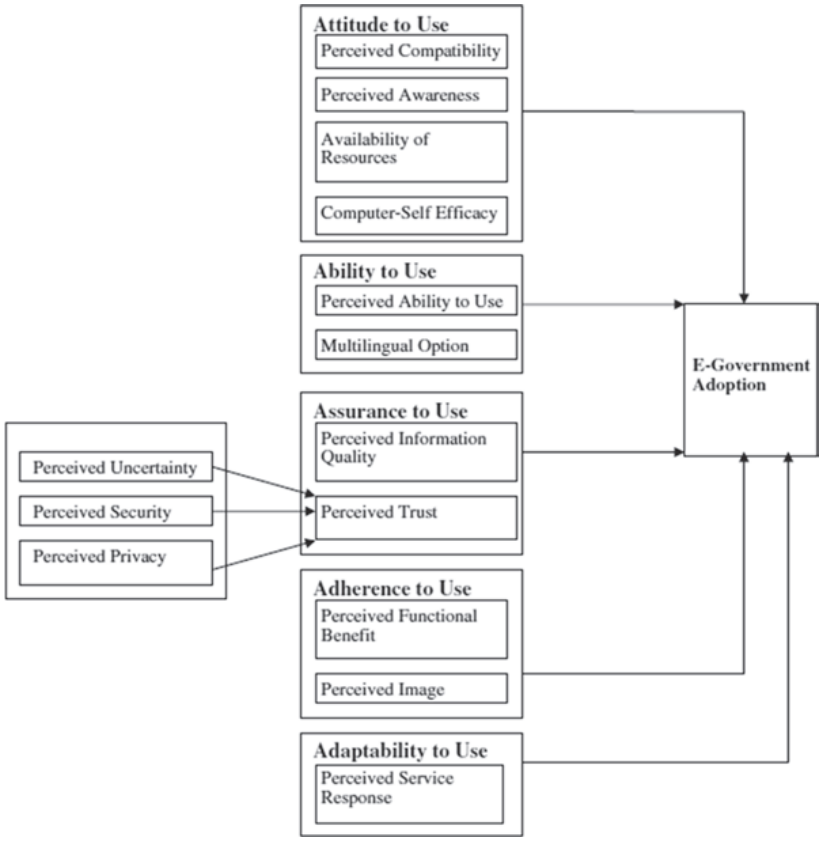

Fig. 15 GAM dimensions (Shareef et al. 2011)

categories of factors influencing citizen take-up of eGovernment solutions at various stages of maturity are: Attitude to use i.e. received compatibility, perceived awareness, availability of resources, computer-self efficancy; Ability to use i.e. perceived ability to use, multilingual option; Assurance to use that is the perceived information quality and trust; Adherance to use i.e. perceived functional benefits, perceived image, and; Adaptability to use that is the perceived service response.

Alhomod and Shafi (2012) in 2012 propose a redefined four-stage model, based on their evaluation of 25 existing models. It is a scientific model, with an abductive approach to eGovernment maturity. The maturity levels are: Presence on the web with portals merely providing information; Interaction between the citizen and the government i.e. downloadable and e-mail forms made available for use; Complete transaction over the web that is secure eService transactions and two-way communication, and; Integration of services i.e. horizontal and vertical integration between authorities to share information and data.

Lee and Kwak (2012) in 2012 suggest a five-stage model with a focus on engagement and data exchange. It is a scientific model, which takes an abductive approach to eGovernment maturity. The model is developed based on observations and data from the US health sector and propose the following maturity levels: Initial conditions not to be confused with "pre-conditions" (e.g. UN, EC and Waseda models) the focus is on one-way static interaction from authorities to citizens; Data transparency with limited use of Web2.0 and social media. Objective is to get public feedback on the usefulness and data quality; Open participation with increasing use of Web 2.0 and social media tools to increase transparency and engagement, and includes eVoting and ePetitioning; Open collaboration incl. interagency collaboration by sharing data and public input and public contests are organised and data is analyzed for obtaining new insights and improving decision-making; Ubiquitous engagement with data easily accessible via mobile devices and data being vertically and horizontally integrated and data analytics is used for decision making processes for authorities continuous improvement of performance.

Dias and Gomes (2014) in their 2014 evaluation of local eGovernment maturity in Portugal propose an adjusted model based on Layne and Lee (2001) and the EU benchmarking models (EC 2012). It is a scientific model, which takes an inductive approach to eGovernment maturity. The model is developed based on observations and data from 239 local authorities in Portugal in 1999, 2007, 2010 and 2013. The proposed model consists of three parallel dimensions each consisting of four stages: Information incl. generic information (i.e. presence), downloadable forms (i.e. interaction), search functionality (i.e. interaction) and parameterize search (i.e. interaction); Service incl. information (i.e. one-way), authentication of user (i.e. two-way), eService transaction (i.e. two-way) and authentication and eService transaction (i.e. transaction); Participation e.g. features (i.e. two-way), authentication and features (i.e. two-way), participative process (i.e. transaction) and advanced participative process (i.e. transaction).

Janowski's (2015) four-stage Digital Government Evaluation Model from 2015, is a scientific model, which takes an inductive approach to eGovernment maturity. It has many of the same features as earlier models but attempt to provide it as a practical tool. It is developed based on observations in developed and emerging

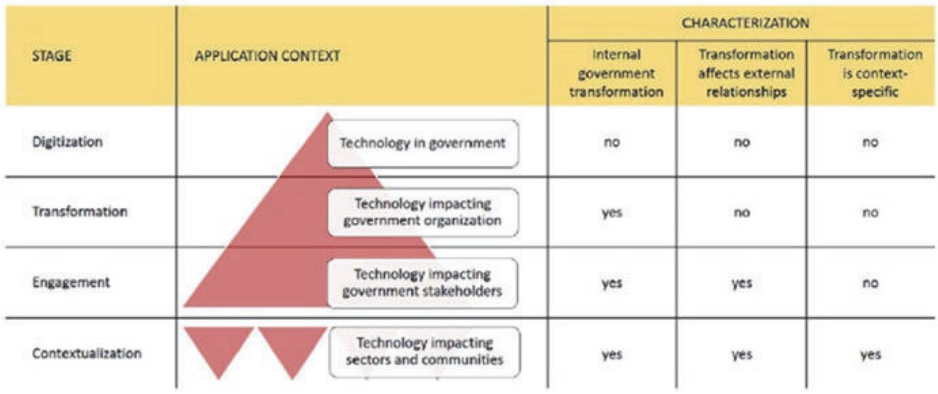

Fig. 16 Digital Government Evolution Model (Janowski 2015)

economies around the world. Rather than mere levels of maturity it propose four-stages of complexity depending on three binary variables: (1) whether digitisation adds to internal work and structures of government without affecting them; (2) transforms internal processes and structures; whether the transformation is internal with, or without affecting the end-users; (3) whether the transformation is depending on a particular application context. The four levels of maturity are (see Fig. 16): Digitisation or technology in government (i.e. precence); Transformation being eGovernment (i.e. transaction and transformation); Engagement or eGovernance (i.e. eParticipation/eDemocracy), and; Contextualisation i.e. policy-driven eGovernance.

Heeks' (2015) Manchester eGovernment Maturity Model from 2015, adapt the Layne and Lee (2001) be less linear in it process, differentiate between the front- and back-office and less "US-centric". It is a scientific model, which takes an inductive approach to eGovernment maturity. The model is developed based on observations in developed and emerging economies around the world. The result is two parallel dimensions consisting of three and four elements respectively, thus forming a matrix (see Fig. 17). The stages are: Sophistication of digitised interaction (i.e. front-office) incl. informed/one-way interaction, interact/two-way interaction and transaction/complete service; Extent of process change (i.e. back-office) incl. digitisation (simple automation), improvement (process integration), redesign (e.g. proactive transaction) and transformation (fundamental change e.g. process elimination).

Stage Models by Origin and Type

The literature review has identified 42 different stage-models. Looking closer at their description, in section "Stage Models Identified and Described", their origin can be traced to either national authorities such as national auditors, or international

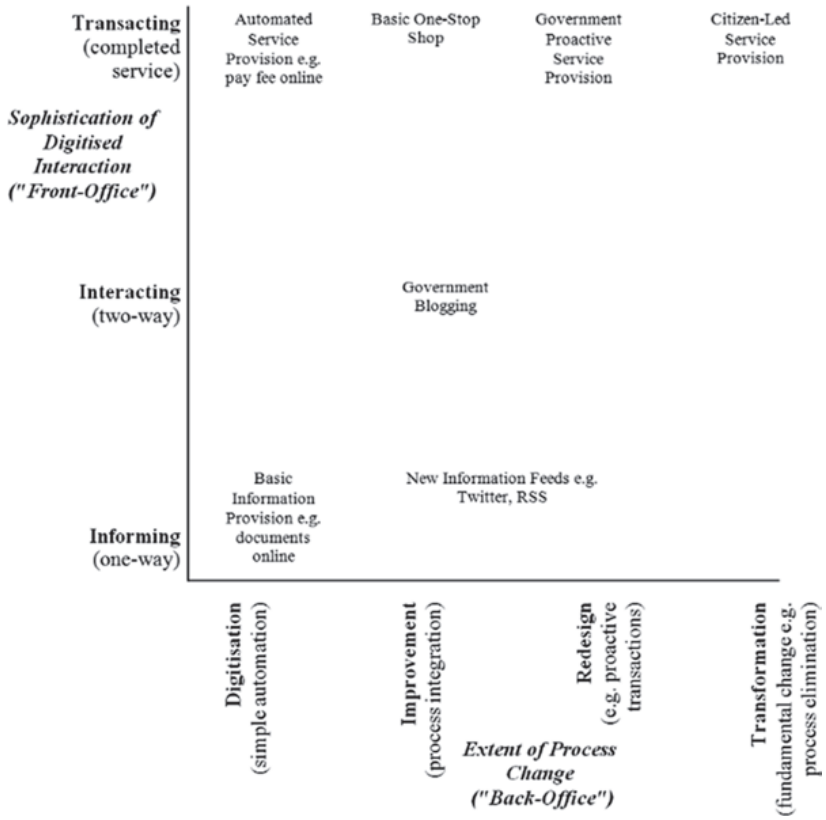

Fig. 17 Manchester eGovernment Maturity Model Metaphores (Heeks 2015)

organisations like the EU or UN, consultancy firms like Deloitte and CISCO or academia. Table 1 present the number of models identified for each of these four categories.

The first model was published by the Australian National Auditing Office in 1999 (ANAO 1999). The latest models are published by Heeks and Janowski in 2015 (Heeks 2015; Janowski 2015). Using the year of publication, the timeline (see Fig. 18) highlight a number of developments.

The first models to emerge are from national authorities, international organizations and consultancies. National models from Australian ANAO (ANAO 1999) to the UK equivalent were published in 1999–2001. International organisations followed with the UN (UNDESA 2014) in 2001 and the EU (EC 2012) and World Bank in 2002 (Toasaki 2003; Alhomod and Shafi 2012). The Deloitte (Deloitte and Touche 2001) through to the Accenture model (Rohleder and Jupp 2003) were published in 2000–2003. The first scientific models were published by (in alphabetical order) in 2001 by Hiller and Belanger (2001), Howard (2001), Layne and Lee (2001) and Silcock (2001), followed by Wescott (2001), Chandler and Emanuel (2002), Moon (2002) and Netchaeva (2002) in 2002. The most recent models includes Dias and Gomas (2014) in 2014 and Janowski (2015) and Heeks (2015) in 2015.

Table 1 Stage models by origin (incl. names of model)

Type of model	Number of models	Name of model
National	5	ANAO (1999), SAFAD (2000), UKNAO (2002), NASCIO (2006), Iribarren et al. (2008).
International	3	UN (2014, 2008, 2010, 2012), EU (EC 2014; European Commission and D.R.a.I. 2013), WB (Toasaki 2003).
Consultant	4	Deloitte (Deloitte and Touche 2001), Gartner (Baum and Di Maio 2000), Accenture (Rohleder and Jupp 2003), Cisco (Cisco 2007).
Scientific	30	Hiller and Belanger (2001), Howard (2001), Layne and Lee (2001), Silcock (2001), Wescott (2001), Chandler and Emanuel (2002), Hogdgkinson (2002), Moon (2002), Netchaeva (2002), Koh and Prybutok (2003), Reddick (2004), Waseda (Obi 2012, 2014, 2015), West (2004), Windley (2002), Davison et al. (2005) Persson and Goldkuhl (2005), Siau and Long (2005), Andersen and Henriksen (2006), Chan et al. (2008), Shahkooh et al. (2008), Almazan and Gil-Garcia (2008),Luna et al. (2013), Kleivink and Janssen (2009), Kim and Grant (2010), Kalampokis et al.(2011), Shareef et al. (2011), Alhomod and Shafi (2012), Lee and Kwak (2012), Dias and Gomes (2014), Heeks (2015), Janowski (2015).

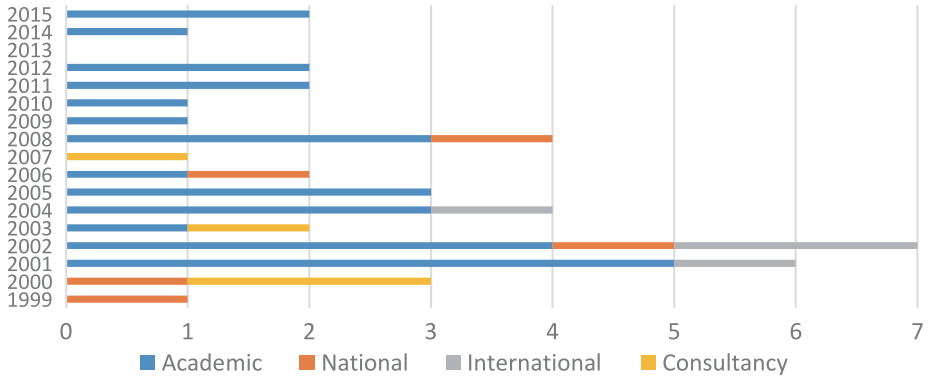

Fig. 18 Stage-models published over time

What is also clear from the literature review is that stage models were of particular interest in 2000–2004 when 23 of the 42 identified models were published (i.e. 54.8%) – including all models originating in international organisations and consultancies.

As presented in Table 2, 22 (i.e. 52.4%) of the identified models are based on practical experiences and case studies with 15 (i.e. 35.7%) being based largely on observations of ICT use in a single country and at a single level of government (e.g. local, regional, or central) public administration. Seven (i.e. 16.7%) models are based on the experiences in multiple countries, i.e. Accenture, UN, EU, Iribarren et al., Janokowski, Wescott and West. Three models (i.e. 7.1%), Windley, Chan et al. and Almazan et al., are based on regional observations in a single

Table 2 Stage-models based on practical experiences and case studies

Model	Type	Experiences/case study
ANAO	National	Australian experience.
SAFAD	National	Swedish experience and ANAO model.
UKNAO	National	UK experiences.
NASCIO	National	USA States.
Iribarren et al.	National	Chilean experience plus experiences of 22 countries. Annual ranking of Australia, Canada, South Korea, Sweden, UK, USA and others.
Accenture	Consultant	Observations in 22 countries. Annual ranking of Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Malaysia, Mexico, the Netherlands, Norway, Portugal, Singapore, South Africa, Spain, the UK and USA.
UN	International	Observations in 193 countries.
EU	International	Observations in 28 EU plus associated member states. Based on SAFAD model. Annual ranking of the countries.
Layne and Lee	Scientific	Observations in the US.
Moon	Scientific	Case study of 2000 US municipalities.
Reddick	Scientific	Observations in US municipalities.
Wescott	Scientific	Observations in Asian-Pacific countries.
Waseda	International	Observations in multiple countries.
West	Scientific	Case studies of from 1813 and 1680 US municipalities in 2000 and 2001 plus observations in multiple countries e.g. in 2006.
Windley	Scientific	Case study of US Utah.gov.
Andersen and Henriksen	Scientific	Case study of 110 Danish stage sites and Layne and Lee model.
Shareef et al.	Scientific	Case study in Canada.
Chan et al.	Scientific	Case study of selected Chinese regional portals.
Almazan et al.	Scientific	Case study of 32 Mexican state portals.
Dias and Gomes	Scientific	Case studies of 239 Portuguese municipalities in 1999, 2007, 2010 and 2013.
Lee and Kwak	Scientific	Observations in US health sector.
Janowski	Scientific	Observations in multiple developing countries.

country, whereas Moon, Reddick and Dias & Gomes (i.e. 7.1%) are based on case studies in municipalities.

The most cited model is hard to asses as the original source of national, international and consultant models are often not citied or referenced appropriately in the literature, is neither publically available, not included in scientific databases, nor available on sites such as research gate and Google scholar. Using Google scholar (accessed on 15 April 2016) the most frequently cited models are all scientific: Layne and Lee's 2001 model (Layne and Lee 2001) with 2031 citations, Moon's 2002 model (Moon 2002) with 1550 citations, Hiller and Belanger's 2001 model (Hiller and Belanger 2001) citied 952, and Andersen and Henriksen's 2006 model

(Andersen and Henriksen 2006) model being cited 453 times. The most cited model not published by academics are Gartner's (Baum and Di Maio 2000) 2000 model with 302 citations.

Maturity Levels in Stage-Models

Analysing the 42 models, 11 different stages are identified: From pre-conditions to transformation (or morphing) and eDemocracy. As illustrated in Fig. 19 (at the end of the chapter), the models and their respective complexity and maturity levels (or stages) varies from simple models such as Reddick's (2004) two-stage model presenting information online and transactional eServices, and the World Bank's (Toasaki 2003) three-stage model, which adds user-engagement to Reddick's version. More complex models includes Dias and Gomes' three-dimensional, 12-stage model (Dias and Gomes 2014), Waseda's four-stages with seven cross cutting themes (Obi 2015), Iribarren et al. with five-stages and 172 indicators, or the UN model with its four-stages and over 200 indicators for its eGovernment Readiness Index (UNDESA 2008). It is particularly interested that models like Dias and Gomes, Heeks and Waseda borrow heavily from the CMM / CMMI models with their multi-dimensional approach.

Two clusters of development are identified in literature (and visualized in Fig. 19). The first cluster appear in the period 1999–2004 and consists of 23 models (i.e. 54.8%). Three of five models published by national authorities, all three international organisations and the four consultancy models are from this period. All models (except Waseda) in this cluster includes maturity stages for publication of static information online, transactional services (i.e. eServices), aspects of back-office integration and a degree of public sector reform. Only the UN, EU and Waseda address pre-conditions such as the availability of internet access, digital literacy and internet use. Similarly, only Gartner, Silcock and Accenture included ICT enabled transformation (or morphing) of public administration. Hiller and Belanger, Wescott, Moon and Netchaeva by contract, address user engagement, participation and decision making (i.e. eParticipation and eDemocracy) to some degree.

A second cluster of emerge from 2005 (but over a longer period) and consist of 19 models (i.e. 45.2%). Three trends emerge within the second cluster. First, all build on the ideas from the 1999–2004 cluster, and includes the presentation of static information online (except Iribarren et al. and Kleivink and Janssen), eServices transactions (except Iribarren et al. and Kleivink amd Janssen), back-office integration and a degree of ICT enabled public sector reform. Second, public sector reform becomes more prominent and is included in 14 models (i.e. 14/19, compared to 4/23). Lastly, eParticipation and eDemocracy is also included in more models. In addition to the 12 models (i.e. 12/19, compared to 7/23) addressing user engagement and decision making published from 2005, the period also see the UN and EU extending their models in order to address these aspects (EC 2012; UNDESA 2012).

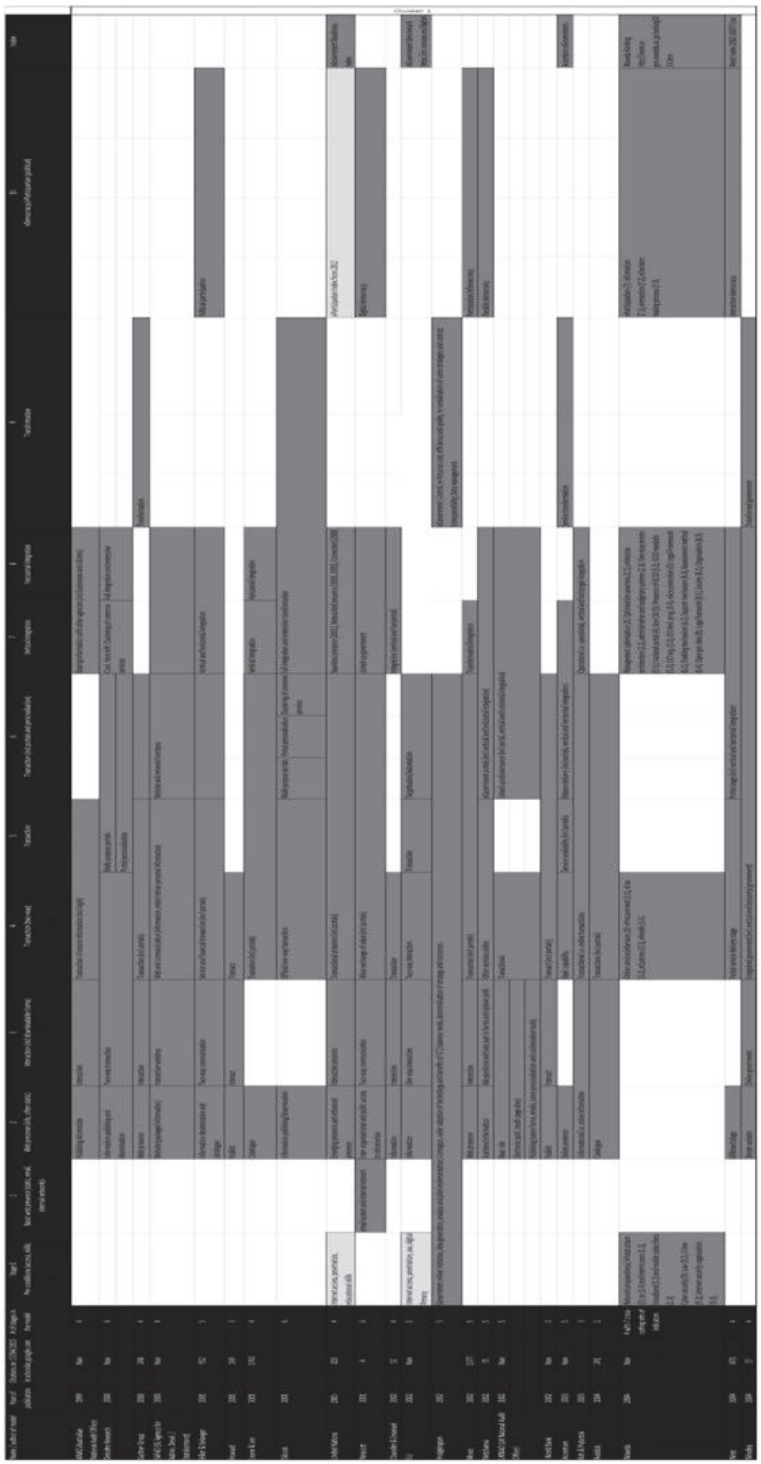

Fig. 19 (**a**) Identified stage models mapped in accordance with their different maturity levels. (**b**) Identified stage models mapped in accordance with their different maturity levels

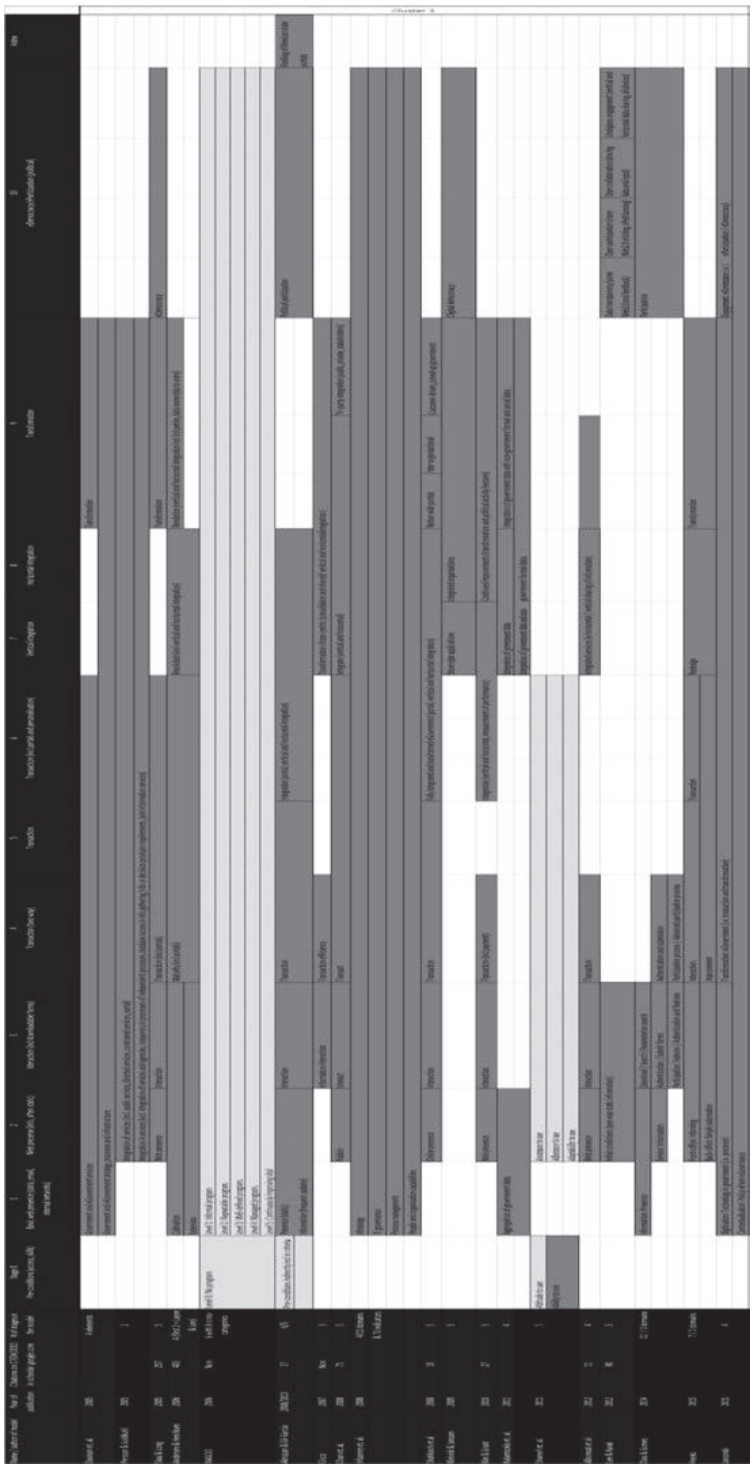

Fig. 19 (continued)

The vast majority of the 42 models use different semantics and metaphors, similarly many models and individual stages overlap (Meyerhoff Nielsen 2016a; b; Alhomod and Shafi 2012; Lee 2010). This means that some general categories exist. In fact, commonalities between national, international and consultancy models, are also shared with many of the scientific models, and is visualized in Fig. 19 (Lee 2010).

Overarching Characteristics and Meta Stages

As the various models are based on different perspectives and use different definition and metaphors, they can be difficult to understand and summarise. To alleviate this difficulty, the 11 meta stages presented in Fig. 19 are distilled further using Lee's qualitative meta-synthesis framework (Lee 2010).

Using a detailed qualitative meta-synthesis procedure Lee use 12 stage-models to develop a new semantic framework consisting of five general metaphors namely: Presenting, Assimilating, Reforming, Morphing, eGovernance. The Lee's five metaphors are defined and described in Table 3 below.

Table 3 Metaphors: their definitions, related stages, and themes (Lee 2010)

Metaphors	Description	Stages/concepts	
		Citizens and services	Operation and technology
Presenting	Presenting information in the information space	Information	
Assimilation	Assimilates (or replicates) processes and service in the information space with the ones in the real world	Interaction	Integration
Reforming	Reform the processes and services in the real world to match the information space requirements, fitting for efficiency	Transaction	Streamlining
Morphing	Change the shape and scope of processes and services in the information space as well as the ones in the real world, fitting for effectiveness	Participation	Transforming
eGovernance	Processes and services in both worlds are synchronously managed, reflecting citizen-involved changes with reconfigurable processes and services	Involvement	Process management

From the analysis of the 42 models, identified in the literature review, it becomes clear that the 11 overarching stages identified represents six specific meta stage characteristics. With respect to Lee's framework, an initial 'pre-condition' stage is missing. A pre-condition stage is therefore added to Lee's framework for the purpose of this article (bringing the number of stages to six) (Meyerhoff Nielsen 2016a).

The 42 models and their respective overarching stages are, in Fig. 20, mapped in accordance with the six meta characteristic described in Table 3. The models are presented chronological and in alphabetical order within said year.

Review of Existing Stage Models

The stage and meta characteristic mapping in Fig. 20 highlight a number of interesting aspects. Table 4 below summaries the number of models, which address each of the six meta stages. The main differences in the models unearth relates to ICT enabled morphing (i.e. transformation) of public administrations and eParticipation and eDemocracy (i.e. user engagement and decision-making).

Preconditions

Models, like the UN (UNDESA 2014), EU (EC 2012), Waseda (Obi 2015) and Iribarren et al. (Iribarren et al. 2008) which include preconditions generally focus on the availability of key enabling factors such as digital literacy, Internet availability and use, electronic identifiers (eID), availability of a basket of electronic services, accessing public sector information, downloadable forms and transactional eServices in aggregated terms. The aim is to enrich analysis and monitor the availability of key enablers. Unfortunately, none of the models addresses the actual use of key enablers like eID's.

While Lee's framework include management and governance issues in the final maturity level (Lee 2010), it may be argued – in line with the IT governance literature (Brown and Magill 1994; Brown and Grant 2005) (see section "Background"), recommendations by the OECD (OECD 2014) and authors like Iribarren, NASCIO and Janowski (Iribarren et al. 2008; NASCIO, N.A.o.S.C.I.O. 2006; Janowski 2015) – that governance structures and cross-governmental cooperation are preconditions for successful ICT implementation and take-up. For instance, is the eGovernment Strategy legally binding for one or all levels of government, what mechanisms govern decision-making, legal changes and coordination processes, benefit realization etc. While most would agree on the objective of IT governance, the Waseda, NASCIO, Iribarren et al., Shareef et al. and Janowski models are the only one, which address it directly (e.g. governance, cooperation and promotion structures, management optimization, policy driven eGovernment) (Iribarren et al. 2008; Meyerhoff Nielsen 2016a; Obi 2015; NASCIO, N.A.o.S.C.I.O. 2006; Shareef et al. 2011; Janowski 2015; Lee 2010).

Name / author of model	Year of publication	# of stages in the model	Pre-conditions (0)	Presenting (1+2+3 / Lee presenting)	Transaction (4+5 / Lee assimilation, transaction)	Reforming User-centric (6+7+8 / Lee Reforming)	Morphing / Personal (9 / Lee Morphing)	eDemocracy (10 / Lee eGovernance)	Ranking/ benchmark/ index evaluation
CLUSTER 1									
ANAO (Australian National Audit Office)	1999	4		2+3	4+5	6+7			
Deloitte Research	2000	6		2+3	4+5	7+8			
Gartner Group	2000	4		2+3	4+5	6+7+8	9		
SAFAD (Swe Agency for Admin. Dev. / Statskontoret)	2000	4		2+3	4+5	6+7+8			
Hiller & Belanger	2001	5		2+3	4+5	6+7+8		10	
Howard	2001	3		2+3	4				
Layne & Lee	2001	4		2	4+5	6+7+8			
Silcock	2001	6		2	4+5	6+7+8	9		
United Nations	2001-	4	0	2+3	4+5	6+7+8		(10)	x
Wescott	2001	6		1+2+3	4+5	6+7+8		10	
Chandler & Emanuel	2002	4		2+3	4	7+8			
EU	2002		(0)	2+3	4+5	6		(10)	x
Hodgenson	2002	5	(0)	1+2+3	4+5		9		
Moon	2002	5		2+3	4+5	6+7+8		10	
Netchaeva	2002	5		2+3	4+5	6+7+8		10	
UKNAO (UK National Audit Office)	2002	5		2+3	4	6+7+8			
World Bank	2002	3		2+3	4+5	6			
Accenture	2003	5		2	4+5	6+7	9		x
Koh & Prybonk	2003	3		2+3	4+5+6	7+8			
Reddick	2004	2		2+3	4+5	6			
Waseda	2004-		0		4	7+8		10	x
West	2004	4		2	4+5	6+7+8		10	x
Windley	2004	4		2+3	4+5	6+7+8	9		
Davison et. al.	2005	4		1+2+3	4+5	6+7+8			
CLUSTER 2									
Siau & Long	2005	5		2+3	4+5	6	9	10	
Persson & Goldkuhl	2005	2		1+2+3	4+5	6+7+8	9	10	
Andersen & Henriksen	2006	4		(1)+2+3	4+5	6+7+8	9	(10)	
NASCIO	2006	6	0	1+2+3	4+5	6+7+8	9	10	
Cisco	2007	3		3	4	7+8	9		
Almazan & Gil-Garcia	2008	6		1+2+3	4+5	6+7+8		10	x
Chan et. al.	2008	5		2+3	4+5	6+7+8	9		
Imbeten et. al.	2008	4					9		
Shahkooh et al	2008	5		2+3	4+5	6+7+8		10	
Klievink & Janssen	2009	5				6+7+8	9		
Kim & Grant	2010	5		2+3	4	6+7+8	9	(10)	
Kalampokis et. al.	2011	4		1+2		7+8	9	10	
Shareef et. al.	2011	5	0	1+2	3+4+5				
Alhomod et al	2012	4		2+3	4	8			
Lee & Kwak	2012	5		2+3			(9)	10	
Dias & Gomes	2014	12 / 3 domains		1+2+3	4+5			(10)	x
Hrecks	2015	7 / 2 domains		2+3	4+5	6+7+8	9		
Janowski	2015	4		1+2+3	4+5	6+7+8	9	10	

Fig. 20 Identified stage models mapped in accordance with Lee's qualitative meta-synthesis framework (Adapted by author to incl. pre-conditions) (Lee 2010)

Table 4 Metaphores: their definitions, related stages, and themes

Pre-conditions: 6/42 (i.e. 14.3%)	United Nations, EU, Waseda, NASCIO, Iribarren et al., Shareef et al.
Presenting: 39/42 (i.e. 92.9%)	ANAO, Deloitte, Gartner, SAFAD, Hiller and Belanger, Howard, Layne and Lee, Silcock, UN, Wescott, Chandler and Emanuel, EU, Moon, Netchaeva, UKNAO, World Bank, Accenture, Reddick, West, Windley, Siau and Long, Persson and Goldkuhl, Andersen and Henriksen, NASCIO, Cisco, Almazan and Gil-Gaarcia, Chan et al., Shahkooh et al., Kim and Grant, Kalambokis et al., Shareef et al., Alhomod et al., Lee and Kwak, Dias and Gomes, Heeks, Janowski (except Waseda, Iribarren et al., Klievink and Janssen).
Assimilation: 38/42 (i.e. 90.5%)	ANAO, Deloitte, Gartner, SAFAD, Hiller and Belanger, Howard, Layne and Lee, Silcock, UN, Wescott, Chandler and Emanuel, EU, Moon, Netchaeva, UKNAO, World Bank, Accenture, Reddick, Waseda, West, Windley, Siau and Long, Persson and Goldkuhl, Andersen and Henriksen, NASCIO, Cisco, Almazan and Gil-Gaarcia, Chan et al., Shahkooh et al., Kim and Grant, Shareef et al., Alhomod et al., Lee and Kwak, Dias and Gomes, Heeks, Janowski (except Iribarren et al., Klievink and Janssen, Kalambokis et al., Lee and Kwak).
Reforming: 36/42 (i.e. 85.7%)	ANAO, Deloitte, Gartner, SAFAD, Hiller and Belanger, Layne and Lee, Silcock, Hodginson, UN, Wescott, Chandler and Emanuel, EU, Moon, Netchaeva, UKNAO, World Bank, Accenture, Reddick, Waseda, West, Windley, Siau and Long, Persson and Goldkuhl, Andersen and Henriksen, NASCIO, Cisco, Almazan and Gil-Gaarcia, Chan et al., Shahkooh et al., Kleivink & Janssen, Kim and Grant, Kalambokis et al., Shareef et al., Alhomod et al., Heeks, Janowski. (Exempt Howard, Hodginson, Iribarren et al., Shareef et al., Lee and Kwak, Dias and Gomes).
Morphing: 18/42 (i.e. 42.9%)	Gartner, Silcock, Hodginson, Accenture, Windley, Siau and Long, Persson and Goldkuhl, Andersen and Henriksen, NASCIO, Cisco, Chan et al., Iribarren et al., Kleivink and Janssen, Kim and Grant, Kalambokis et al., Lee and Kwak, Heeks, Janowski.
eDemocracy: 19/42 (i.e. 45.2%)	Hiller and Belanger, UN, Chandler and Emanuel, EU, Moon, Netchaeva, Waseda, West, Siau and Long, Persson and Goldkuhl, Andersen and Henriksen, NASCIO, Almazan and Gil-Gaarcia, Shahkooh et al., Kim and Grant, Kalambokis et al., Lee and Kwak, Dias and Gomes, Janowski.

Presenting Online Information and Services

Emerging from a national context, the Australian ANAO and SAFAD models (see Fig. 2) (Persson and Goldkuhl 2005) were introduced to categorize, evaluate process and guide government organisations' decisions on what services could and should provide. Layne and Lee's (2001) 2001 maturity model streamlines the development stages online information and transactional services by merging different aspects into two categories (see Fig. 4), that is: Catalogue of static information and downloadable forms one websites and transactional aspects such as online service and forms (i.e. eServices).

Dias and Gomes (2014) adjust the Layne and Lee (2001) and the EU benchmarking models (EC 2012) in their 2014 evaluation of local eGovernment maturity in

Portugal. The proposed model consists of three parallel dimensions each consisting of four stages: (1) Information: Generic information (i.e. presence), downloadable forms (i.e. interaction), search functionality (i.e. interaction), parameterize search (i.e. interaction); (2) Service: Information (i.e. one-way), authentication of user (i.e. two-way), eService transaction (i.e. two-way), authentication and eService transaction (i.e. transaction); (3) Participation: features (i.e. two-way), authentication and features (i.e. two-way), participative process (i.e. transaction), advanced participative process (i.e. transaction).

Iribarren et al. eGOV-MM model (see Fig. 13) (Iribarren et al. 2008) takes a multi-dimensional approach including the front- and backoffice, policy, management and oranisational capacities. Criticizing the Layne and Lee's model (2001) for being too linear and too 'US-centric' Heeks' Manchester eGovernment Maturity Model differentiate between the front- and back-office (Heeks 2015). The result is two parallel dimensions which forms a matrix (see Fig. 17). One focus on the sophistication of digitised interaction (i.e. one and two-way interaction plus transaction) and the extent of process change (i.e. simple digitisation and automation, improvement process integration, redesign/reform and transformation) which is similar to Waseda (Obi 2015), IT governance and CMM/CMMI approach by NASCIO, Iribarren and others (Iribarren et al. 2008; NASCIO, N.A.o.S.C.I.O. 2006).

While these adjustments to the presentation and publication of information and eServices have evolved over time, none of the models includes actual use. This is in sharp contrast to research in public administration reform – whether it is a NPM efficiency or a JUG effectiveness approach (Bannister and Connolly 2011; Cordella and Bonina 2012; Bannister 2001; Meyerhoff Nielsen and Mika 2014). This is unfortunate as the value added of a project comes from its use, not its existence.

Vertical and Horizontal Integration (Reforming)

Layne and Lee's stage model breaks with the initial models, by including vertical and horizontal integration as two distinct, and most advanced, levels of maturity to their model (see Fig. 4) (Layne and Lee 2001). Both Deloitte (Deloitte and Touche 2001) and Gartner (Baum and Di Maio 2000) mirror this development.

Persson and Goldkuhl (2005) in 2005 evaluates a number of existing models and propose a two-stage model with a clear computer science perspective. Based on Layne and Lee (2001), their focus is on the integration of services (i.e. services, directed services, concentrated services and portals) and integration in services including horizontal and vertical integration of organisations, processes, the exchange and re-use of data - with the data focus being similar to OGD Maturity Model by Kalambokis et al. (see Fig. 14) (Kalampokis et al. 2011).

ICT Enabled Reform and Transformation (Reform and Morphing)

The review in section "Preconditions". (see Table 4, Figs. 19 and 20) identified 36 (i.e. 85.7%) models which includes ICT enabled reform of public administration as a maturity level. Of these only half (i.e. 18 models or 42.9% of all models) address ICT enabled transformation (or morphing).

The Klievink and Janssen (2009) five-stage is of particular interest. The level of customer orientation increases with every stage of the model, as does the level of flexibility and includes: Stovepipes, integrated organisations, nationwide portals, inter-organisational integration and customer-driven, joined-up government. The Klievink and Janssen model clearly reflect joint-up government (i.e. integration) and outcomes based thinking seen in public administration and eGovernment literature.

Kim and Grant (2010) propose continuous improvement as a fifth and final maturity level in their 2010 model. Featuring political activities and a focus on continuous improvements and performance it sees ICT as a tool enabling public sector innovation and reform – on par with the logic behind agile development in the IT sector. Lee and Kwak's (2012) takes a similar approach in their data based model for collaboration and ubiquitous engagement. Although data and collaboration forms the core of Lee and Kwak's model, the development stages follow a 'classical' stage-model pattern, i.e. publication, assimilation, reform and transformation and does therefore not cover Gov3.0. Janowski's (Janowski 2015) model focus on complexity of ICT enabled reform and move from a 'classical' model focus to a fourth and final contextual stage.

The IT governance and CMM/CMMI models, like Davison, Iribarren et al., NACSIO and Waseda, provides a particular interesting multi-dimensional perspective and inclusion of both human, management and organisational capacities (Iribarren et al. 2008; Davison et al. 2005; Obi 2015; NASCIO, N.A.o.S.C.I.O. 2006).

Considering the level of academic consensus of ICT as an enabler of public sector reform and transformation, the limited attention paid to actual outputs and results is surprising. Similarly, not of the models adequately address the Gov3.0 concept.

Cooperation is indirectly addressed by all the models addressing reform and transformation, but none look at the role governance play to ensure backoffice integration or the outcomes required to move from one stage to another. Here the IT governance and CMM/CMMI models, like Davison, Iribarren et al., NACSIO and Waseda, stands out with their multi-dimensional perspective and the inclusion of both human, management and organisational capacities (Iribarren et al. 2008; Davison et al. 2005; Obi 2015; NASCIO, N.A.o.S.C.I.O. 2006).

Stage Models with a Participative and Democratic Dimension (eGovernance)

The Hiller and Bélanger (2001) and Deloitte and Touche (2001) – and in 2003 the World Bank (Toasaki 2003) with respect to legislative consultations – are the first to add a dimension of engagement and co-creation (indirectly by none-governmental stakeholders) and aspects of participation in a democratic sense. The focus is nonthe-less on supply, technology and organisational integration.

In contract active engagement, participation and democratic decision making are aspects of the most advanced maturity levels proposed by authors like Moon (2002) and Siau and Long (2005) while Chan et al. (2008) adds none-governmental stakeholders to the mix of their five-stage model focusing on supply, technology and organizational integration. Similarly the UN eParticipation index was introduced in 2012 (UNDESA 2012) and EU benchmark has included aspects since 2013 (EC 2012).

Lee and Kwak's (2012) five-stage model focus on engagement and data exchange between authorities (i.e. horizontal and vertical integration), transparency by increasing access to data, user-engagement and participation in decision making (i.e. eParticipation and eDemocracy), and lastly on the total transformation of the way public administration deliver services and make decisions (i.e. ubiquitous engagement).

While increased levels of transparency in the government, political and democratic processes is laudable, the latter two does not necessarily constitute a maturity level in their own right. Especially, when focusing on ICT use to improve the efficiency, effectiveness, quality and value added of public sector service delivery.

Realigning the Stage Model to Focus on Integration, User-Centricity and Outcomes

While stage models like indexes and benchmarks are helpful in mapping the supply and sophistication levels of eService offerings, they all have a technological focus. The relevance of these different models is therefore limited in terms of governance, cooperation and measuring the successful use of online offerings – and thus the value added. In contrast to other stage models, Andersen and Henriksen (2006) follow an activity- and user-centric approach to personalisation of online services in their Public Sector Process Rebuilding (PPR) model (illustrated in Fig. 11). Andersen and Henriksen extends the Layne and Lee's model (see Fig. 4) (Layne and Lee 2001) by making an online presence, horizontal and vertical integration the foundation of their PPR model (Meyerhoff Nielsen 2015, 2016a; Alhomod and Shafi 2012). Klievink and Janssen also address outcomes but anchor their model in the joint-up government research stream (Klievink and Janssen 2009). The approach is interesting as it also reflects ideas around whole-of-government approaches (Frissen et al. 2007; Huijboom et al. 2009b; Traunmüller and Wimmer 2003; Millard

2010), JUG (Bannister and Connolly 2011; de Bri and Bannister 2010) and personalisation of online service delivery (Meyerhoff Nielsen and Igari 2012; Meyerhoff Nielsen and Robert 2015).

The importance of outcomes is a key topic with the both the public administration reform (Bannister and Connolly 2011; Bannister 2001, 2007; de Bri and Bannister 2010), IT-governance and computer science (Brown and Grant 2005) and eGovernment literature (Cordella and Bonina 2012; Traunmüller and Wimmer 2003; Scholl 2009; Janowski 2015). Seven models are complimented with various benchmarks, indexes and rankings (EC 2012; UNDESA 2014; West 2004; Rohleder and Jupp 2003; Obi 2014; Almazan and Gil-Garcia 2008; Luna et al. 2013; Dias and Gomes 2014) but several researchers have questions the value of their due to their simplicity, their supply and technology focus (Lips 2012; Meyerhoff Nielsen 2015, 2016a; Bannister 2007; Heeks 2006, 2015; Rorissa et al. 2011). Andersen and Henriksen are the first researchers, which have taken an outcomes based approach but do not include take-up, qualitative or quantitative indicators. The Waseda (Obi 2015) model differs somewhat from other stage models as it does not define distinct levels of maturity. The focus is on qualitative and quantitative indicators including network preparedness and infrastructure, management optimisation and efficiency etc. Unfortunately, it does not directly address the actual use of eServices, but rather pre-conditions like internet and mobile subscriptions.

Conclusion

The review of the 42 stage-models identified, their respective maturity levels and meta charateristics show that aspects of Gov3.0 aspects such as ICT enabled integration, transformation, sharing of data and increased participation a number of weaknesses persists.

First, all models, with the exemption of the PPR (Andersen and Henriksen 2006), Howard (2001) and Klievink and Janssen (2009) models, have a technology and supply orientated, i.e. no focus on outcomes or actual use (Meyerhoff Nielsen 2016a, b; Alhomod and Shafi 2012; Lee 2010). This is unfortunate as the tangible benefits of any ICT solution and eServices in particularly can only be realized through the actual and effective use of supplied eServices by citizens (OECD 2014; UNDESA 2014; Meyerhoff Nielsen 2016a; Meyerhoff Nielsen and Mika 2014; Meyerhoff and Kelly 2011).

Second, most of the models have no real understanding of core government service concepts. For instance individual service elements – that is information, transaction capability, personal data – are not separate maturity levels but rather elements in a given service request and subsequent delivery. Similarly downloadable forms are merely a type of static information and does not warrant a separate maturity level (Meyerhoff Nielsen 2016a, b). This is particular surprising considering that 22 models (i.e. 52.4%) are partially based on observations, experiences and case studies in one or more countries (see Table 2).

Third, decision-making, as illustrated by the eParticipation and eDemocracy stages, should not be considered an eGovernment maturity level. Dias and Gomes (2014) makes this argument indirectly, when defining engagement, petition and voting solutions as types of public services. That is, public services which consist of information, transaction capability and some form of data, e.g. information about an election, and internet voting solution allowing for vote casting, plus data such as unique ID numbers, name and address for authorizing a vote. Thus the eParticipation and eDemocracy stage(s) should be seen as an indication of democratic maturity and degree of transparency in a country not as eGovernment maturity levels (Meyerhoff Nielsen 2014, 2016a; Dias and Gomes 2014).

Fourth, front-office service provision and back-office integration are mixed-up in a number of models. For instance, one-stop-shop portals does not constitute a form of transaction, but is rather an indicator of degree to which authorities cooperate and integration in the provision of services via a portal (Meyerhoff Nielsen 2015, 2016a). Heeks attempt to address this by proposing a two dimensional matrix model distinguishing between the front- and the back-office (Heeks 2015). Unfortunately, Heeks does not account for governance or take-up.

Fifth, none of the identified models addresses governance directly. Some, like the Davison et al. (2005), Iribarren et al. (2008), Janowski (2015), Kalambokis et al. (2011), Shareef et al. (2011) and Waseda (Obi 2015) models, highlight management and coordination issues such as the existence of chief information officers. Cooperation on the other hand is indirectly addresses in most models. This is manifested in terms of vertical and horizontal integration, and the existence of one-stop-shops, the sharing of information and data between different authorities and levels of government – even private and third party stakeholders (Lee and Kwak 2012; Chen and Mingins 2011).

Sixth, as illustrated by Figs. 19 and 20 most models merely restructure or adjust existing ones. Key exemptions are the IT governance models like NASCIO (NASCIO, N.A.o.S.C.I.O. 2006) and Iribarren et al. (2008), Andersen and Hendriksen's PPR model (Andersen and Henriksen 2006), Hodgkingson's focus on learning curves (Hodgkinson 2002), Davison's four elements (Davison et al. 2005), Shareef's (Shareef et al. 2011) dimensions, Waseda's approach (Obi 2015) and Janowski's (2015) approach, all of which builds on existing models while attempting to address outcomes and governance issues.

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Article III

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eGovernance Frameworks for Successful Citizen Use of Online Services: A Danish-Japanese Comparative Analysis

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Abstract: the use of Information Communication Technology (ICT) by the public sector is often highlighted as a key tool for the transformation of public sector service delivery. Recent literature reviews have highlighted the limited understanding of the role played by governance, inter-governmental decision making and cooperation when introducing ICT solutions and online services to citizens. As part of a larger qualitative, multi-country comparison, this article compares the Danish and Japanese approaches to electronic governance (eGovernance) and inter-governmental cooperation to answer the question: Does a strong governance model and high level of intergovernmental action lead to the successful supply and use of online citizen services?

The analysis finds that the two cases support academic arguments in favour of a strong eGovernance model and a high level of inter-governmental cooperation and decision making. The article finds that a political- or public sector-driven and motivated public sector modernisation, a consensus seeking and an inter-governmental approach to eGovernment, trust between actors, and the role of formal and informal are important determinants for success, as illustrated by the continued strength of the Danish governance and joint-governmental cooperation model over the more fragmented Japanese approach. Still, both countries would benefit from a more holistic approach to service delivery, process, and organisational reengineering in order to progress further.

Keywords: Digitization, eGovernment, eGovernance, Innovation, Japan, Denmark

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1. Introduction

This article attempts to answer one key question: *Does a strong governance model and high level of intergovernmental action lead to the successful supply and use of online citizen services?*

As part of a larger research project, the article makes use of a comparative, qualitative, multi-country framework (2012, Yin 2013), and presents the initial findings from research carried out in Denmark and Japan.

The article is structured in eight specific sections: firstly, an introduction (section 1) and research background (section 2) is presented. Afterwards, the outline of the methodology used, the rational for the case selection, and the key socio-economic contexts for Denmark and Japan (section 3) are shown, together with the identification of the paths pursued in relation to ICT use in public administration in Denmark and Japan (section 4). This is linked with their respective approaches to governance and intergovernmental cooperation (section 5). An identification of the outcomes of the national approaches is also provided, with the article using the degree of internet availability, existence of key enablers, eServices and their use as effect indicators (section 6). Finally, the article concludes with a comparative analysis (section 7) and the association of the findings to the original research questions (section 8).

2. Research Background

The use of Information Communication Technology (ICT) and electronic government (eGovernment) strategies generally aims to increase the efficiency and effectiveness of public sector service delivery, or modernizing or even transforming public administration and society at large. The strategies developed for the introduction of information communication technology (ICT) to public administration differ between countries. Similarly, the governance and intra-governmental corporation models applied also vary, with some authorities and countries being relatively more successful in their eGovernment endeavours than others.

Despite the maturing of the eGovernment research area, limited research has been conducted on the role played by national governance models and the level of intergovernmental cooperation for the roll-out and use of online citizen services. International benchmarks have long received attention from authors like Millard and Fehlmann (2007) and international organisations like the European Commission (EC) (2012, 2014) or the United Nations (UN) (2008, 2010, 2012, 2014, 2016, 2016). Where academic or policy focused, case studies have generally examined the introduction of ICT in public administration (PA), as illustrated by Leitner et. al. (2003), Millard and Fehlmann (2007), Huijboom (2009) or the OECD (2011, 2014, 2015). Authors such as Brown and Magill (1994), Heeks (2005, 2007), Bannister and Connolly (2011), Pollitt and Bouckaert (2011), Cordella and Bonina (2012) have researched governance and cooperation but largely in relation to ICT-enabled public sector reform in the PA literature. In information systems (IS) management research by (Brown and Magill (1994), Brown and Grant (2005), Weill et al. (2006), Iribarren et. al. (2008), Klischewski and Scholl (2008), Poeppelbuss et. al. (2011) have covered governance and cooperation. While in the field of eGovernment and eGovernance the governance and cooperation

ankles have been covered by e.g. Heeks and Bailur (2007), Millard et. al. (2008), Huijboom et. al. (2009, 2010).

Past research has been criticizing the public sector for only addressing specific issues. This includes blindly digitising existing processes (Bannister 2001, Traunmüller and Wimmer 2003, de Bri and Bannister 2010), shining light on technological details, or merely introducing IT and technology (Janssen, Charalabidis et al. 2012, Lips 2012, Meyerhoff Nielsen 2015). Only Andersen and Henriksen (2006), Bannister (2007), Cordella and Bonina (2012), have focused on the actual output, outcome, and impact of ICT use in public administration and for service delivery. The author's literature review (2016, 2017) finds that research on public sector reform, IT governance, and eGovernment does not adequately address the role which governance and cooperation plays in the successful supply and use of online eServices. While many benchmarks and case studies refer to the so-called eGovernment stage or maturity models, Meyerhoff Nielsen's analysis of 42 identified stage models and their specific meta characteristics identifies six weaknesses (2014, 2015, 2016, 2017).

First, all models, with the exception of the Andersen and Henriksen's PPR (2006) and Klievink and Janssen's (2009) models, are technology- and supply-oriented, and do not address use or outcomes (Lee 2010, Alhomod and Shafi 2012). As tangible benefit realization of any ICT solution and eServices can only be achieved through their actual use, this is unfortunate (Meyerhoff and Kelly 2011, Meyerhoff Nielsen 2011, UNDESA - United Nations Department of Economic and Social Affairs 2014, de Bri and Bannister 2015).

Second, most models have no real understanding of core public service delivery concepts. For instance, individual service elements (e.g., information, transaction capability, and personal data) are not at separate maturity levels but are elements in a given service request and the subsequent delivery of said service. Similarly, downloadable forms are merely a type of static information and do not warrant a separate maturity level (Meyerhoff Nielsen 2015, 2017). This finding is particularly surprising, given that roughly half (i.e., 22 of 42) of the models are partially based on observations, experiences, and case studies in at least one country.

Third, back-office integration and front-office service delivery is mixed up in many models. For instance, one-stop shop portals do not constitute a form of transaction, however, it is a sign of the degree to which authorities cooperate and strive for an integrated and whole-of-government approach to service delivery via portals (Meyerhoff Nielsen 2015, 2016, 2017). Heeks (2015) partially addresses this problem with a two-dimensional matrix model which distinguishes between the back- and front-office, yet the model does not account for governance or actual use.

Forth, decision making, as exemplified by the eParticipation and eDemocracy stages, should not be considered an eGovernment maturity level. Dias and Gomes (2014) make this argument indirectly in defining engagement, petition, and voting solutions as types of public services – that is, those consisting of information, transaction capability, some form of data (e.g., election data), Internet voting solutions allowing for vote casting, and data such as unique ID numbers, names, and addresses for authorising votes. Therefore, eParticipation and eDemocracy stage(s) should be seen as indications of democratic maturity and transparency, not as eGovernment maturity levels (Dias and Gomes 2014, Meyerhoff Nielsen 2014, 2017).

Fifth, none of the identified models addresses governance directly. Most models indirectly address cooperation in the form of vertical and horizontal integration, the existence of one-stop shops, and information sharing among authorities and governmental levels, even private and third-party stakeholders (Chen 2011, Lee and Kwak 2012). Others, such as the Waseda index, highlight management and coordination issues, including the existence of chief information officers (Obi 2012, 2014, 2015, 2016).

Sixth, most models merely adjust or restructure existing ones. Key exceptions are Andersen and Hendriksen's PPR (2006) and Waseda's models (Obi 2012, 2014, 2015, 2016). Both build on previous models, but seek to address outcomes and governance issues.

In conclusion, past research does not address the key question asked in the introduction to this article. That is: *Does a strong governance model and high level of intergovernmental cooperation lead to the successful supply and use of online citizen services?* Three working hypotheses are proposed:

Hypothesis 1: A strong governance model leads to (i) supply and (ii) use of online services.

Hypothesis 2: A high level of intergovernmental cooperation leads to (i) supply and (ii) use of online services.

Hypothesis 3: A strong coordinated link between national vision, strategy, action plan, and initiatives leads to (i) supply (ii) and use of online services.

3. Methodology

To address the research question (*Does a strong governance model and high level of intergovernmental cooperation lead to the successful supply and use of online citizen services?*), as identified by Meyerhoff Nielsen's literature review and analysis of maturity (2016, 2017), a classical exploratory, qualitative, two-case comparative study methodology is applied (Benbasat, Goldstein et al. 1987, Rohlfing 2012, Yin 2013). This approach establishes a framework for in-case analysis and cross-case comparison. The aim of the in-case analysis is to identify the governance mechanisms in play in each of the two cases and a subsequent cross-case comparison. The aim of the cross-case comparison is to determine whether a correlation (i.e., the more of Y, the more X) exists between a strong cooperative governance model (cause) and the introduction of online services (effect 1) and subsequent citizen use of the online service delivery channel (effect 2).

To facilitate the cross-case comparison, a context, content, process model (CCP model) (Devos, Buelens et al. 2007), as adapted by Krimmer (2012), is used within each case. Developed for the use of electronic and internet-based electoral and voting technologies, Krimmer's CCP model consists of four macro-dimensions: background indicators; national governance and cooperation models; national approaches to eGovernment, and; effect measurements and preconditions. Each dimension explains a key area that influences processes, choices and outcomes in relation to eService supply and take-up. Using the framework, the article compares Denmark and Japan to identify their respective strengths and weaknesses in relation to their respective governance models and eGovernment experiences, with a particularly focus on the period since 2010.

3.1. Case Selection

Denmark and Japan are chosen based on a "most similar" but "most different" principle (Benbasat, Goldstein et al. 1987, Collier and Mahoney 1996, Yin 2013). In terms of population, both countries can be considered nation states with a single dominating ethnic group, language, and culture. The population is ageing in both countries, although faster in Japan, which also has a higher life expectancy and median age. Both countries have well educated, and highly urbanized populations, with population density in Japan being more than 2.5 times higher than in Denmark. School-life expectancy in Denmark is a full 19 years compared to Japan's 15 years, however, both countries have practically eradicated illiteracy and have a highly educated and skilled labour force, as illustrated in Table 1.

Socio-economically, the two countries are both high-income nation states with export driven economies. Denmark is a relatively small country by territory, population, and GDP, with an open-export lead economy with low GDP and productivity growth. Japan is, by comparison, a large country in the midst of a decade long recession. Both countries have low levels of unemployment and low unemployment rates. Japan has, by international standards, a relatively large current account deficit and one of the world's highest public debt rations, whereas the Danish public debt is relatively low for a high-income country, as outlined in Table 1.

Table 1: Socio-economic data 2016 (CIA - Central Intelligence Agency 2017)

	Denmark	**Japan**
Territorial size	43,094 km2	377,915 km2
Population	5,724,456	126,702,133
Population density	129.5 per km2	335.8 per km2
Population growth	0.22% (est'16)	-0.19% (est'16)
Official languages	Danish	Japanese
Ethnic composition	Scandinavian, Inuit, Faroese, Turkish, Polish, Syrian, German, Iraqi. Note: no percentages given.	Japanese 98.5%, Koreans 0.5%, Chinese 0.4%, other 0.6%. Note: some 230,000 Japanese are of Brazilian decent.
Live expectancy/ median age	79.4 years/ 42 years	85 years /46.9 years
Urbanization	87.7% (est'15)	93.5% (est'15)
School life expectancy (primary to tertiary education):	19 years	15 years

GDP (billion) (PPP)	€259.41 bill (est'16)	€4,179.84 (est'16)
GDP per capita (PPP)	€39,492 (est'16)	€32,968 (est'16)
GDP growth	1.3% (est'16)	0.5% (est'16)
Unemployment	4.2% (est'16)	3.2% (est'16)
Imports (billion)	€79.85 (est'16)	€543.58 (est'16)
Exports (billion)	€72.04 (est'16)	€533.75 (est'16)
Public debt	34.2% of GDP (est'16)	237.7% of GDP (est'16)
Current account	-2.5% of GDP (est'16)	-5% of GDP (est'16)
Inflation	0.3% (est'16)	-0.1% (est'16)

The two countries have similar levels of socio-economic development and infrastructural sophistication, but different history, culture, population sizes, and different organizational, cultural, and linguistic traditions. In short, Denmark and Japan offer vastly different perspectives, experiences, population size, administrative systems, and levels of complexity. In particular, the difference in administrative traditions and cultures will help isolate the potential role played by their respective governance models, the level of intergovernmental cooperation, and the strategic focus between 2010 and 2017. The aim is neither to identify difference in cultural or administrative traditions nor how they may influence decisions, but rather to identify how governance and intergovernmental cooperation models function despite these differences.

3.2. Research Approach

This article, and the two case studies it is based on, was developed in two steps. First, desk research was carried out and resulted in a conference paper published at the peer-reviewed IFIP EGOV-ePart conference in September 2016 (Meyerhoff Nielsen 2016) and CeDEM Asia Conference in December 2016 (Meyerhoff Nielsen 2016). Second, stakeholder interviews were carried out, which main goal is to validate and compliment the desk research findings. The objective and value of the interviews is to shed light on actual forms of coordination and cooperation, something that is neither reflected in official policy documents or organigrams, nor captured by previous research or policy documents - including the author's desk research and analysis.

The primary sources of the first phase (i.e. initial desk research and analysis) include structured keyword search, in English, in peer reviewed publications in leading academic databases, such as Web of Science and Scopus, but also ResearchGate and GoogleSchoolar. The keywords used include a variation of *governance*, *eGovernance*, *eGovernment*, *citizen*, *eServices*, *public service delivery*, *Denmark*, and *Japan* from 2000 onwards. With only limited results, policy documents from national and international statistical sources were used, such as the International Telecommunications Union (ITU) (2014), UNDESA's eGovernment Readiness Index (2008, 2010, 2012, 2014, 2016), www.internetworldstats.com, and relevant international references (e.g., UN and EU). Several

quantitative precondition and effect measurements, like internet availability and penetration, the use of online banking and shopping (i.e., indirect measurements of digital skills), eIDs and a basket of eServices and international benchmarks are included to provide the empirical basis for the effect of a given governance model.

The primary sources for the second phase (i.e. validation and complementation of the initial desk research) are interviews with relevant stakeholders in Denmark and Japan. Semi-structured interviews (i.e., one way of conducting interviews) entails the development of a list of questions on topics, also known as an interview guide (Bryman and Bell 2015). The interviews lasted between 45 and 90 minutes, depending on interviewees' experience and depth of knowledge. All interviewees were sent a written interview guide at least four weeks prior to the scheduled interview. The interview guide included information on the research interview objectives, the list of potential questions covered during the interview, information about confidentiality, privacy, anonymity, data protection, and contact details for the Research Ethics Committee of the University of Tartu if an interviewee should have any ethical concerns (Bryman and Bell 2015). References to interviews are anonymized and the intention to do so was confirmed at the beginning of each interview. The aim of the anonymized interviews is to facilitate as forthcoming answers from the interviewees as possible. The author/interviewer has kept a list of interview dates, times, location, interviewee names, their occupation, contact details, and organisations.

All interviews were recorded following the interviewee(s) acceptance and summary notes were made in writing. Interviews were carried out in-person, bar a few exemptions in Denmark which were carried out by telephone or Skype for logistical reasons. Interviews were either individual or in small groups to ensure efficiency.

In Denmark, all interviews were carried out in Danish (the interviewee is a Danish native speaker). In Japan, all interviews were carried out in a mix of English and Japanese with a professional English-Japanese interpreter accompanying the author/interviewer during all interviews. The interviewer and the English-Japanese interpreter had a short debriefing following each interview to ensure that any culturally specific observations were communicated to the interviewers. The aim of the debriefing was to establish whether interviewees had seemed uncomfortable with the question or tried to avoid giving a straight answer. In general, all Danish and Japanese interviewees were very forthcoming. When the interviews confirm, provide alternative explanations or add additional detail to the desk research (Meyerhoff Nielsen 2016), such information is included and cited in this article.

A total of 16 interviews with 31 interviewees from central and local government, academia, and the private sector were carried out in Denmark (4-11 May 2017) and Japan (29 November - 2 December 2016, and 17 May 2017). The variation in the number of interviews and interviewees is the result of different national set-ups, number of actors and availability, but the mix of stakeholders interviewed is similar for both countries. Table 2 outlines the number of interviews as well as the number and type of actors the interviewees represent.

Table 2: Number and type of interviewees and interviewees per country (source: author)

Country	Number of interviews	Number of Interviewees	Type and number of interviewees
Denmark	10	15	6 x Central government 0 x Regional government 7 x Local government 1 x Academia 1 x Private sector
Japan	6	16	8 x Central government 0 x Regional government 2 x Local government 4 x Academia 2 x Private sector (informal conversation at GLOCOM)

4. eGovernment Focus

ICT has long been used in public administrations in Denmark and Japan, but policy and strategy focus vary, as expected. A historic overview is helpful for comparing the two national governance models.

4.1. eGovernment in Denmark since 2001

As a plan for maximizing the ability of management to achieve a set of organizational objectives (Heeks 2005), the Danish eGovernment strategies have followed a similar trajectory as most countries around the world. While the focus has shifted from defining and implementing relevant standards, infrastructure, and services to benefit realization, the key objectives of the Danish eGovernment strategies have been to make Denmark a leading information and knowledge society, and to increase efficiency and productivity while preserving the welfare-state model and associated values (DIGST - Digitaliseringsstyrelsen 2011, Meyerhoff Nielsen 2011, 2016).

The strengthening of cross-governmental cooperation and management in IT projects has been a recurrent theme since 2004. Similarly, data exchange and interoperability has been pursued (Meyerhoff Nielsen 2014, 2016). The initial focus was on the supply of eServices and the roll-put of eID, but the 2011-2015 strategy included cost-savings and benefit realization through mandatory self-service and the business case model.

The 5th eGovernment Strategy for 2016–2020 follows a similar pattern and builds on previous strategies. The focus is on increased effectiveness and usability of eServices, as well as the value added; welfare technologies; private sector growth through public sector digitization, administrative burden reduction, data sharing and reuse (including the once only principle); a more coherent eGovernment framework (i.e., less silos); maintaining and improving the IT infrastructure; privacy and data protection; and improving the management of IT projects and common public programs and efforts (DIGST - Digitaliseringsstyrlesen 2016, Meyerhoff Nielsen 2016). The Danish eGovernment focus since 2001 is summarized in Table 3.

Table 3: eGovernment in Denmark 2001–2020 (DIGST - Digitaliseringsstyrlesen 2016, Meyerhoff Nielsen 2016)

2001-2003: Digital collaboration	Allowing citizens to send e-mail to the public sector and authorities to adopt digital channels of communication. Examples: digital signatures.
2004-2006: Internal digitalization and efficient payments	Focus on secure e-mail between authorities, joint government standards, and portals. Examples: eFaktura (eInvoice), NemKonto (single bank account for government use), Virk.dk (business portal), Sundhed.dk (health portal), and digital document and archive systems.
2007-2010: Shared infrastructure and one point of access	Mandatory use of shared infrastructure; components and standards; increased cooperation; value added services; and efficiency. Examples: Borger.dk (the citizen portal), NemID (digital signature), NemLog-in (single, sign-on), eIndkomst (electronic income registry), Digital Post, NemSMS (SMS service component), and business case model.
2011-2015: The path to future welfare	Focus on benefit realization; mandatory use of Digital Post and selected eServices; reuse of data; increased cooperation. Examples: data distribution, investment in IT and digital teaching aids, tested welfare technology, digital literacy, and campaigns.
2016-2020: A stronger and more secure digital society	Focus on better, more coherent, user-friendly online services, ICT-led growth and efficiency, security, cross-government cooperation, and benefit realization. Examples: user-journeys for e.g. moving, business reporting and company registration, administrative burden reduction, once-only-principle, data driven growth, SMART cities, legal framework, security, cloud computing, ICT support, and joint service center for portals and joint-government components like NemID, Digital Post, etc.

4.2. eGovernment in Japan since 1994

The December 1994 Cabinet "Master plan for promoting government-wide use of IT" can be considered as the first coordinated Japanese national strategy. Clear strategy documents for the promotion of ICT use in public administration and eGovernment have been in place since 1994. Japan initially followed a similar policy path as many other countries. Focus has foremost been on the roll-out of government networks and broadband infrastructure, while focusing on ICT-enabled efficiency and effectiveness initiatives, and public sector reform and governance of ICT initiatives and strategies (Jain 2002, Meyerhoff Nielsen and Igari 2012, Igari 2014, Meyerhoff Nielsen 2016). Similarly, there has been a focus on front-office services and portals. The approach remains unnecessarily complex, with strategies for ICT and open data added in 2010 and 2012, respectively (ITSH - IT Strategic Headquarter 2010, 2012), with limited focus on benefit realization and usability, and only recent emphasis on strengthening the governance model guiding ICT investments (Jain 2002, Meyerhoff Nielsen and Igari 2012, Igari 2014, Meyerhoff Nielsen 2016).

The i-Japan Strategy 2009–2015 has been replaced by the Declaration to be the World's Most Advanced IT Nation for 2016–2020, which was revised in mid-2016. Considering that the introduction of a unique electronic identity (eID) was scheduled for 2013, but was only agreed upon in late 2015, it is not surprising that eIDs are a key focal point of the current strategy. The lack of progress regarding one-stop services, an absence of intergovernmental corporation on ICT issues, and scandals surrounding "missing pensions records", have damaged public confidence in ICT in Japan (Meyerhoff Nielsen and Igari 2012, Hiramoto 2013, Igari 2014, Meyerhoff Nielsen 2016). To address the strategy aims of achieving a safe, secure, and comfortable life for citizens by creating a society in which all citizens are dynamically engaged, the 2016–2020 strategic focus is on breaking down barriers between ministries to achieve cross-cutting coordination, with the Government CIO acting in a guiding capacity, and the deployment of successful national initiatives to both regional and local level – which are considered promising developments (ITSH - IT Strategic Headquarter 2016).

Despite several years in the making and awareness of the potential benefits, Japan still lacks national standards for interoperability and enterprise architecture, and is yet to develop, share or reuse common components and contents – even if the MyNumber eID/Digital Signature is launched and an open data strategy is in place (Meyerhoff Nielsen and Igari 2012). A fact confirmed by multiple interviews in both the public sector (Interview 3 Japan 2016, Interview 4 Japan 2016) and in academia (Interview 1 Japan 2016, Interview 6 Japan 2016). The Japanese eGovernment strategies since 1995 are summarized in Table 4.

Table 4: eGovernment in Japan 1995-2020 (ITSH - IT Strategic Headquarter 2016, ITSH - IT Strategic Headquarter 2016, Meyerhoff Nielsen 2016)

1995-2000: Master plan for promoting government-wide use of IT (rev. 1997)	ICT-enabled public sector reforms. Promotion of the information society. Examples: roll-out.
2001-2003: e-Japan strategy	Emphasis on key IT infrastructure and use, including broadband roll-out nationally, increased use of IT and internet, plus eService development. Examples: government portal, Public Key Infrastructure (PKI), establishment of Strategic Steering Committee in PM's office. IT Basic Law on the formation of an advanced IT network society.
2003-2009: e-Japan II	Focus on eGovernment promotion for increased efficiency and effectiveness, including ICT-enabled public sector reform. Examples: one-stop services, optimization plans for business process and systems.
2009-2015: i-Japan II	Focus on ICT use and solutions at national and local level, in healthcare and education. Coordination and cooperation for the implementation of eGovernment, which should be user-centric and secure. Examples: eID, digital PO Box, Electronic Health Record, create a governance structure including appointment of CIOs.
2016-2020: Declaration to be the World's Most Advanced IT Nation	Focus on back-office reform, including business process reengineering and systems elimination (up to 908 systems) and 100 billion Yen cost saving. Reform of employment security and pensions. Front-end services including roll-out of national ID cards and numbers to improve social security and tax number systems and user-friendliness. Promotion of safe and secure data exchange, including open data and cybersecurity. Improvement of national governance structures. Examples: eliminate up to 908 systems, save Yen 100 billion annually in operation costs. ID card and eID, launch user-orientated data and AI platform, updated open data platform. Promote reforms by Deputy Directors-General for Cybersecurity & Information Technology.

5. Governance Models and Institutional Frameworks in Place

Policies and initiatives are developed and carried out differently from country to country. As summarized in Table 5, the general governance and institutional frameworks in Denmark and Japan are no different.

Table 5: General governance and institutional frameworks in Denmark and Japan (Meyerhoff Nielsen 2016)

	Denmark	**Japan**
National institutional framework and governance	Centralized model. National, regional and local government level. Consists of 5 regions and 98 municipalities.	Centralized model. National, regional and local government level. Complex system of 47 prefectures, multiple sub-prefectures and districts, 1719 municipalities of four "Kanje" types (city, town, ward, non-municipality).
Decentralization of government authority	Large degree of local autonomy and decision making including tax and budget spending. C.70-80% of citizen services are provided by municipalities. Degree of central control via annual budget negotiations.	National government control prefectures and municipalities, including tax collection, borrowing. C. 70% of budget is allocated to municipalities. Lack of progress on intergovernmental cooperation and decentralization.

Both countries have centralized institutional frameworks and approaches to governance. Service delivery is largely carried out by local government who has a high level of autonomy. Taxes are set for national, regional, and local level in both countries. In Denmark, this must be within a centrally determined pre-defined band, and collected by the national Tax Agency (Meyerhoff Nielsen and Igari 2012, Meyerhoff Nielsen 2016). In Japan, each level of government sets and collects their own taxes. In Denmark, regions are largely limited to hospitals and some infrastructure delivery. Even if factoring in the population and geographical size of Japan, the organizational complexity is high, with multiple forms of regional and sub-regional authorities. Similarly, Japan's local government structure is complex to navigate with city, town, ward, and even non-municipality "Kanje" types of local authorities (Meyerhoff Nielsen and Igari 2012, Igari 2014). The complexity of Japans institutional framework and governance structures was confirmed by the interviews (Interview 2 Japan 2016, Interview 3 Japan 2016), particularly the academic community (Interview 1 Japan 2016, Interview 6 Japan 2016).

In conclusion, Japan has a more complex institution framework and approach to governance. Intergovernmental cooperation is, by comparison, also less entrenched in Japan as illustrated by both taxation and in eGovernment; such will be illustrated in the coming sections.

5.1. eGovernance and Coordination in Denmark since 2010

Japan and Denmark also take different approaches to governance, decision making, and the degree of cooperation between authorities and levels of government, the private sector, civil society, and research. Despite these differences, similarities also exist. Table 6 summarizes the governance of eGovernment strategies and action plans in Denmark and Japan.

Table 6: eGovernment governance and cooperation models (Meyerhoff Nielsen 2016)

	Denmark	**Japan**
Responsible authority for eGovernment strategy	Ministry of Finance (MoF), Danish Agency for Digitization (DIGST) including the Portfolio Steering Committee (PSC) for the eGovernment Strategy.	IT Strategy Council/CIOs Council (ITSC) and IT Strategic Headquarters and its national CIO (since 2016) for the promotion of an Advanced Information and Telecommunications Network Society (ITSH - IT Strategic Headquarter), in Cabinet Office. Regulatory responsibility is in the Ministry of Internal Affairs and Communication (MIC).
Responsible authority for action plan	DIGST.	ITSH and national CIO (since 2016) responsible for annual priority policy programs, MIC has the regulatory responsibility for eGovernment
Responsible authority for initiating and coordinating new eGov strategies and action plans	DIGST.	ITSH, in principle.
Chairperson organization	DIGST on behalf of MoF.	PM chairs ITSC and ITSH but not MIC, whose responsible minister is a member, despite the regulatory responsibility. National CIO at ITSH (since 2016) is responsible for meetings.
Hosting organization and secretariat	DIGST.	Cabinet office host ITSC and the ITSH, but ITSC and ITSH is physically located in a building of the MIC (Interview 2 Japan 2016,

		Interview 3 Japan 2016)
Member organizations	Representatives from MoF (i.e. DIGST), key ministries like economy, taxation, justice, science, health and interior, Danish Regions (DR) and Local Government Denmark (LGDK).	PM, Chief cabinet secretary, MIC, Minister of Posts and Telecommunications, Minister of International Trade and Industry, plus other key ministries. IT and technology industry representatives and academia represented.
National eGovernance and cooperation model	Centralized with mixed features, i.e. process driven by DIGST but representatives from all levels of government, initiatives from all stakeholders, consultative and consensus based with a strong mandate.	Hybrid, i.e. centralized in relation to strategy and policy development, but decentralized and uncoordinated in relation to prefectures and municipalities – not represented on ITSC or in ITSH. MIC has regulatory responsibility for eGovernment. Weak ITSH mandate compared to MIC. In practice, the ITSC and ITSH are located in the MIC building and a large number of staff is on loan from MIC leading to a high level of informal coordination and a minimisation of potential conflicts (Interview 1 Japan 2016, Interview 2 Japan 2016, Interview 3 Japan 2016, Interview 6 Japan 2016)
Process of eGovernment strategy and action plan development and approval (from idea to approval by government)	Centralized process coordinated by DIGST but in consultation with all relevant state holders including key ministries, DR and LGDK, private and civic interest groups.	Centralized process coordinated by ITSH and with consultation of large IT and technology companies. MIC and other strong ministries does not necessarily comply with ITSH. Lack consultation with prefecture, municipalities and other interests.
eGovernment strategy legality	Yes, part of the government program.	Yes, part of the government program.

Action plan (i.e. is the strategy underpinned by an action plan)	Yes.	No, annual policy priorities program in place for e-Japan II 2003-2009 but and again for 2016-2020 strategy including KPIs.
Action plan legally binding	Yes, is part of the government program and annual budget negotiations between all levels of government.	No.

In Denmark, the governance model has evolved over time. The governance and management model has been the subject of review with each passing eGovernment strategy and has been adapted over time (Meyerhoff Nielsen 2016), and confirmed by multiple interviews including representatives from local government (Interview 3 Denmark 2017), central government (Interview 6 Denmark 2017), and academia (Interview 8 Denmark 2017).

Since 2010, DIGST has been responsible for eGovernment strategies and action plans and their daily coordination. This includes a mandate to initiate and ensure benefit realization and compliance. DIGST was established following a merger of the key government players, including the Digital Taskforce (established in 2005) and hosted by the Ministry of Finance, the Agency for Governmental Management, and the eGovernment related standards, infrastructure and platforms from the National IT- and Telecom Agency. Policy documents and past research highlight that the aim was to improve the efficiency and effectiveness of the governance model (DIGST - Digitaliseringsstyrelsen 2011, Meyerhoff Nielsen 2011, 2014, 2016). Interviews with representatives from both local (Interview 3 Denmark 2017, Interview 5 Denmark 2017) and central government (Interview 6 Denmark 2017) confirm the aim and the practice.

Since the 2010 eGovernment strategy onwards, decision making has largely been made at the Steering Committee for the eGovernment strategy (SC). The SC meets 10–12 times annually, is chaired by DIGST on behalf of the Ministry of Finance, and consists of representatives (generally directors and key unit heads) from key ministries, plus Danish Regions (DR), and the Local Government of Denmark (LGDK) (Meyerhoff Nielsen 2011, 2014, 2016). A practice confirmed by interviews with the representatives from the local government (Interview 3 Denmark 2017) and the coordinating agency (Interview 6 Denmark 2017).

In 2016, the name and mandate of the Steering Committee for eGovernment has been strengthened. The new Portfolio Steering Committee (PSC) (i.e. Portføljestyregruppe in Danish) is a continuation of the previous SC and has overall responsibility for executing the eGovernment strategy and its initiatives, i.e. incorporates the previously held Joint Committee for Cross Government Cooperation (STS) mandate (DIGST - Digitaliseringsstyrlesen 2016).[1] The PSC is now

[1] The Joint Committee for Cross Government Cooperation (STS) was established in 2010 and operated until 2015, when its mandate was incorporated into the new Steering Committee (i.e. Portføljestyregruppe)

also responsible for the realignment of the strategic direction of the joint-governmental use of ICT and digitisation, e.g. due to technological development. Each year, a status report on progress, effect, and agreed goals for the digitization strategy is prepared by individual initiatives. Like its predecessor, the PSC is assembled 10-12 times annually (DIGST - Digitaliseringsstyrlesen 2016). Interviews with local government (Interview 3 Denmark 2017) and the coordinating agency (Interview 4 Denmark 2017, Interview 6 Denmark 2017) highlight the importance of the adjustment as a way to strengthen operational and daily coordination and the efficiency of the governance model.

For each of the eGovernment action plan initiatives, a programme or project steering committee or workgroup are established (by the joint governmental PSC) to ensure successfully implementation. The aim is to ensure proper coordination of individual elements in a given programme or project, ensure ownership across partners, and minimise the risk of unsuccessful completion through decentralised decision making. The individual programme and project steering committees and working groups report to SC on a monthly basis and can escalate issues to the forum. The SC is supported by two standing committees on legal issues (i.e. Stående udvalg om juridisk spørgsmål), and financial and budgetary (i.e. Økonomiudvalg) issues, respectively. The legal committee assists by providing suggestions for realignment of regulations and legal provisions to facilitate increased ICT use and also re-use of data between authorities. The financial and budgetary committee is tasked with the overall responsibility for the ongoing financial management of the eGovernment strategy, including management of under- and over-spending at the initiative level and any proposals for spending adjustments on a yearly basis (DIGST - Digitaliseringsstyrlesen 2016, Interview 6 Denmark 2017). This is, in part, underpinned by the use of the joint-governmental IT programme and project model, which is mandatory for initiatives exceeding DKK 10 million (c. € 1.3 million) with a large ICT component (Meyerhoff Nielsen 2014).

DIGST - Digitaliseringsstyrlesen (2016). Governance. Copenhagen, DIGST - Digitaliseringsstyrelsen.. The STS was chaired by the Ministry of Finance and met approximately four times per year. It consists of permanent secretaries sitting in the cabinet committees for coordination and economic affairs and management committees of DR and LGDK. The STS members thus advise the individual ministers in the cabinet before an eGovernment strategy is presented to the parliament for approval by the Minister of Finance, on behalf of the government. For national strategies and reform program there is a tradition to have broad parliamentary support, including from opposition, to ensure continuity in the strategic direction of the country Meyerhoff Nielsen, M. (2011). "Danish eGovernment Success Factors: Strategies and Good Practice Examples." Global Strategy and Practice of E-Governance: Examples from Around the World: Examples from Around the World: 231, Meyerhoff Nielsen, M. Y., Mika (2014). "An analysis of the Danish approach to eGovernment benefit realisation." Internet Technologies and Society 2014 Conference Proceedings: 47-58, Meyerhoff Nielsen, M. (2016). Governance and online service delivery: The Danish case. Electronic Government and Electronic Participation, Guimaraes, IOS Press. The role of STS has over time changed from including implementation and management issues to the strategic approval of a given vision, eGovernment strategy, its action plan and associated budget as well as its completion and was discontinued with the 2016-2020 eGovernment strategy DIGST - Digitaliseringsstyrlesen (2016). Et stærkere og mere trygt digitalt samfund: Den fællesoffentlige digitaliseringsstrategi 2016-2020. Copenhagen, DIGST - Digitaliseringsstyrelsen, DIGST - Digitaliseringsstyrlesen. (2016). "Digitaliseringsstyrelsen." Retrieved 25 March 2016, 2016, from www.digst.dk , DIGST - Digitaliseringsstyrlesen (2016). Governance. Copenhagen, DIGST - Digitaliseringsstyrelsen..

While DIGST, since 2016, has been guided by the Minister for Public Sector Innovation, said minister operates within the Ministry of Finance. In practice, the newly establish PSC continues to be chaired by DIGST on behalf of the Ministry of Finance, with members from key central government actors responsible for business, growth, justice, education, interior affairs, regional and local government (DIGST - Digitaliseringsstyrlesen 2016, DIGST - Digitaliseringsstyrlesen 2016). Interviews with multiple actors from local and central government confirms the practice (Interview 3 Denmark 2017, Interview 4 Denmark 2017, Interview 5 Denmark 2017, Interview 6 Denmark 2017, Interview 10 Denmark 2017). To bring a sense of order and oversight to the Danish eGovernance model responsibilities, information flows and decision making is formalized as illustrated by decision making flows in the official organigram in Figure 1 and overview of strategic intiatives illustrated in Figure 2. A formalized approach is particularly important as the number of initiatives with steering committees and working groups in the action plan adds complexity to the Danish approach, as illustrated by the official organigram in Figure 2 (in Danish).

Figure 1: Organigram of the eGovernment strategy, Portfolio Steering Committee and project steering committee in Denmark 2016-2020 (DIGST - Digitaliseringsstyrlesen 2016)

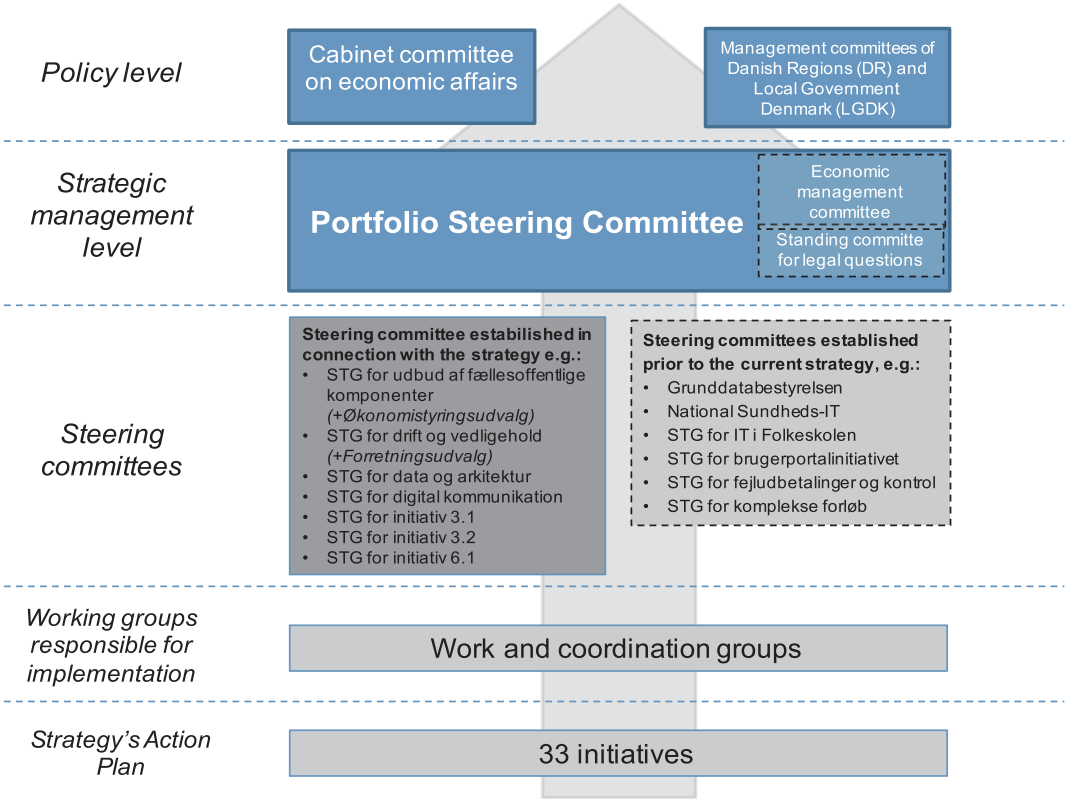
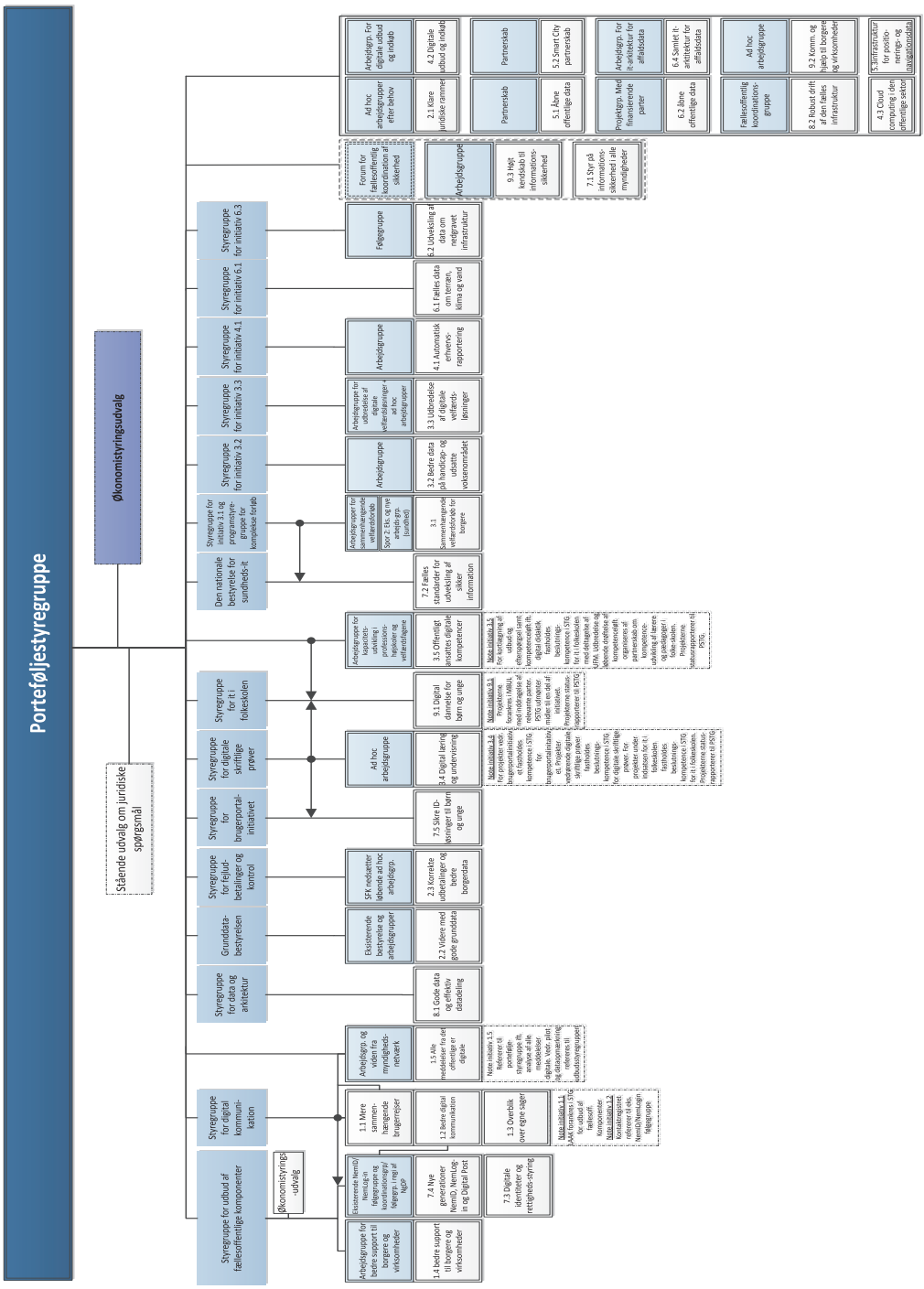


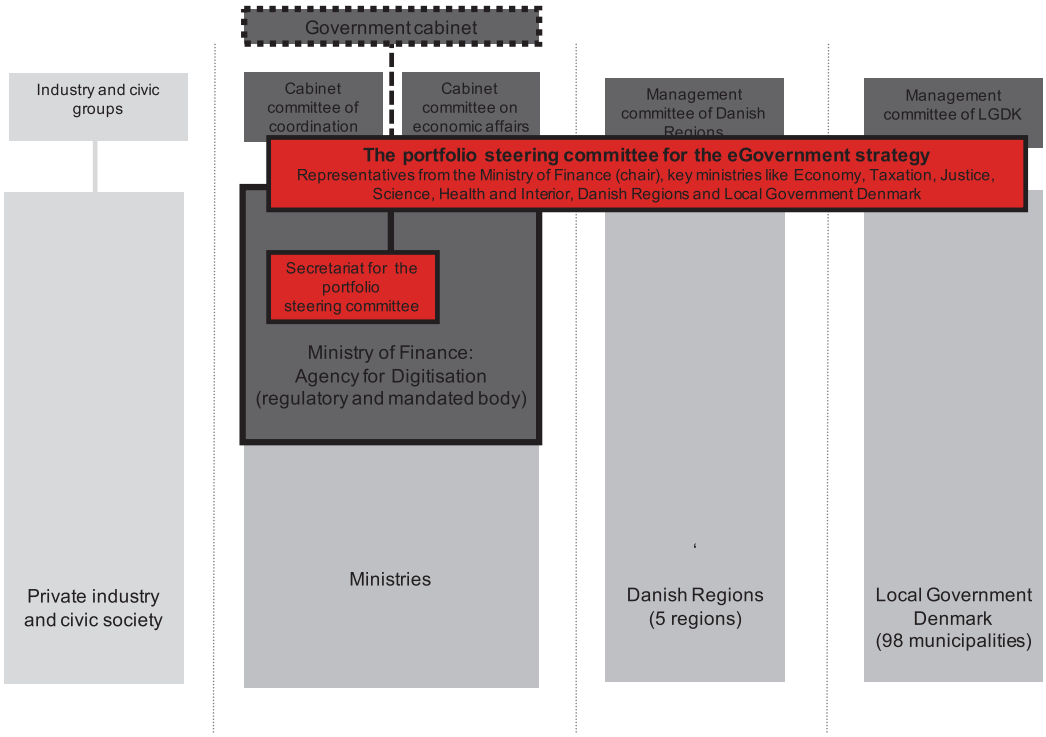
Figure 2: Overview of the eGovernment strategy initiatives, Portfolio Steering Committee and project steering committee in Denmark 2016-2020 (DIGST - Digitaliseringsstyrelsen 2016)



Stakeholders directly involved in the PSC and in the eGovernment strategy's action plan include key central government actors responsible for social services, tax, interior, education, health, core registers, cadastral data, the management committees of umbrella organisations of Danish Regions and Local Government of Denmark. As confirmed by policy documents (DIGST - Digitaliseringsstyrlesen 2016, DIGST - Digitaliseringsstyrlesen 2016), previous research (Meyerhoff Nielsen and Igari 2012, Meyerhoff Nielsen 2016, 2016), and academic interviews (Interview 8 Denmark 2017), citizens, businesses or academia are not directly represented in any aspects of the formal governance model. That said, interviews with local government actors (Interview 3 Denmark 2017, Interview 5 Denmark 2017, Interview 7 Denmark 2017), central government and the coordinating agency (Interview 1 Denmark 2017, Interview 4 Denmark 2017, Interview 8 Denmark 2017) show that with every new strategy and action plan, formal and informal consultation is carried out by DIGST. Interviewees from academia (Interview 8 Denmark 2017) and the private sector (Interview 2 Denmark 2017) confirm that stakeholders indirectly involved includes the IT sector (e.g. Dansk ITs politiske udvalg for IT i den offentlige sector and the Danish IT-industry's political committee for IT in the public sector), the private sector (e.g. Danish Industry), and citizen groups (e.g. senior citizen representatives). Similarly, private vendors contracted for the implementation of individual initiatives generally participate in the relevant programme and project steering committees and working groups. Both aspects are confirmed by interviews with local (Interview 3 Denmark 2017, Interview 5 Denmark 2017, Interview 7 Denmark 2017) and central government representatives. (Interview 1 Denmark 2017, Interview 4 Denmark 2017, Interview 8 Denmark 2017).

On an operational level, the current strategy has formally introduced the concept of programme and project steering committees and working groups. Interviews emphasized that the change was introduced to facilitate greater coordination between initiatives with inter-dependencies and provide more clarity (Interview 3 Denmark 2017, Interview 6 Denmark 2017). Interviews confirmed that DIGST is open to, and actively encourages, participation from central, regional and local authorities in individual initiatives (Interview 2 Denmark 2017, Interview 3 Denmark 2017, Interview 4 Denmark 2017, Interview 5 Denmark 2017, Interview 7 Denmark 2017, Interview 9 Denmark 2017, Interview 10 Denmark 2017). Authorities seem to limit their engagement due to resource constraints. Several authorities indicated in their interviews that they focus their resources on those initiatives where they deem to have most at stake in shaping the outcomes, the most insight and knowledge (Interview 7 Denmark 2017, Interview 9 Denmark 2017, Interview 10 Denmark 2017). Despite the general openness, interviewees at local level (Interview 7 Denmark 2017, Interview 9 Denmark 2017) and in academia (Interview 8 Denmark 2017) highlighted that the experienced level of transparency and consultation is unclear and hard to figure out, when the strategy and action plan initiatives is initially. The stakeholders involved in the Danish eGovernance model is illustrated in Figure 3.

Figure 3: Stakeholders in the Danish eGovernance and coordination model (source: author)



In conclusion, the strength of the eGovernance model is the cyclical evaluation and strengthening with each eGovernment strategy. The strong mandates and roles of DIGST and the PSC (including the past Steering Committee) are key in Denmark's eGovernment successes. The joint-governmental nature helps create a joint vision and ownership to the national vision, strategy, and action plans. Similarly, the link between goals and KPIs in the strategy and individual initiatives help ensure successful implementation and benefit realization, in part assisted by the joint-governmental IT-programme and -project model. While formal and informal consultations are the norm for new eGovernment strategies, it is unfortunately the private sector, academia, and select end-user groups that are not formally part of the eGovernance model, as this could help ensure a more holistic approach to ICT use in public administration and focus, including breaking down organizational barriers to the benefit of citizens and businesses. Similarly, consultation and transparency for new strategies, and particularly on the envisaged focus and outcomes of action plan initiatives, could be strengthened in relation to local authorities and non-governmental stakeholders.

5.2. eGovernance and Coordination in Japan since 2001

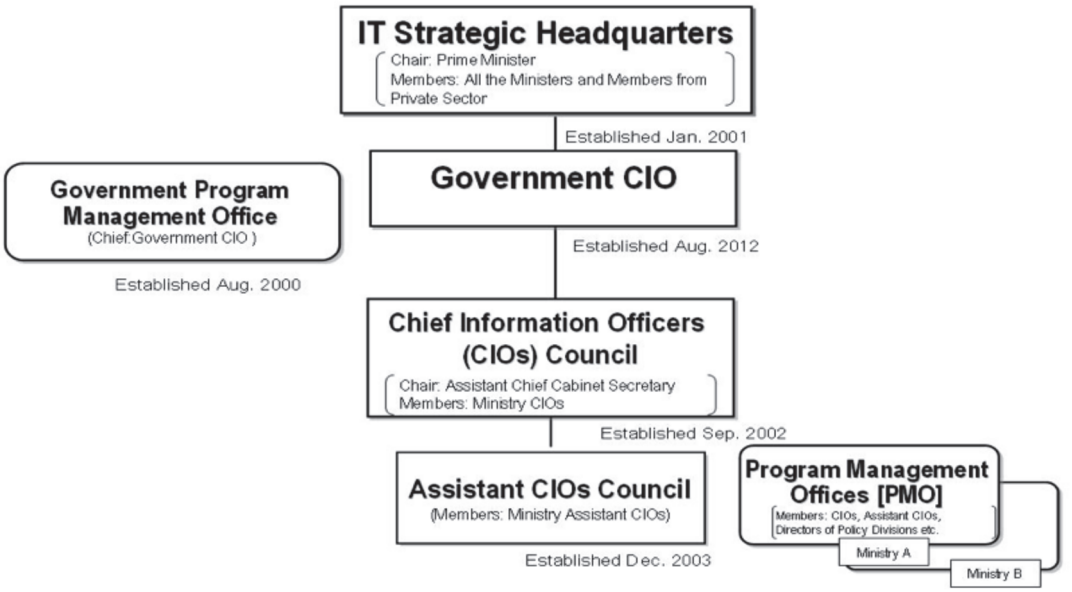
Since January 2001, the IT Strategic Headquarter (ITSH) has been Japan's mandated body and key eGovernment coordinator. The ITSH is located in the cabinet office and acts as the secretariat for the IT Strategic Council/CIOs Council (established in September 2002 and henceforth ITSC), the planning board (established March 2010), and several committees.

With the 2016–2020 declaration, a national Government CIO position was created within the ITSH. The new government CIO is tasked with the guidance of the national eGovernment strategy, including cooperation with relevant headquarters and the development and management of evaluation indicators for monitoring of progress (including KPIs for the strategy). Similarly, the government CIO evaluates the IT-related measures of ministries and agencies, proposes a revision of existing initiatives and goals within the overall framework, and budgets the eGovernment strategy (Kantei 2015, Interview 1 Japan 2016, Interview 2 Japan 2016, Interview 3 Japan 2016, ITSH - IT Strategic Headquarter 2016, ITSH - IT Strategic Headquarter 2016).

The Ministry of Internal Affairs and Communication (MIC) is a regulatory authority responsible for ICT, including prefectures and municipalities. Selected representatives from large IT and technology firms and academia are represented in the ITSC (Figure 4). An analysis of official policy documents and organigrams shows that roles, responsibilities. and mandates of the planning board in decision-making, and in relation to the ITSC and the government CIOs appointed in August 2012, is somewhat ambiguous. Subsequent interviews with academics (Interview 1 Japan 2016, Interview 6 Japan 2016), central government and the coordinating agency (Interview 2 Japan 2016, Interview 3 Japan 2016) highlight that the government CIO is responsible for coordination, however, lacks mandate to ensure compliance with the national vision or eGovernment strategy. While the different mandates and regulatory responsibilities between the ITSH and MIC look like a source of potential conflicts of interest and confused mandates (Jain 2002, Meyerhoff Nielsen and Igari 2012, Igari 2014, ITSH - IT Strategic Headquarter 2016), in practice, the potential conflict between the ISTH and MIC is minimal, as the ISTH is physically located in the MIC rather than the cabinet building. At the same time, a large number of ISTH staff is seconded from the MIC and other key authorities, such as the Ministry of Tax, as confirmed by interviews with both government actors, the coordinating agency (Interview 2 Japan 2016, Interview 3 Japan 2016, Interview 5 Japan 2016), and academics (Interview 1 Japan 2016, Interview 6 Japan 2016).

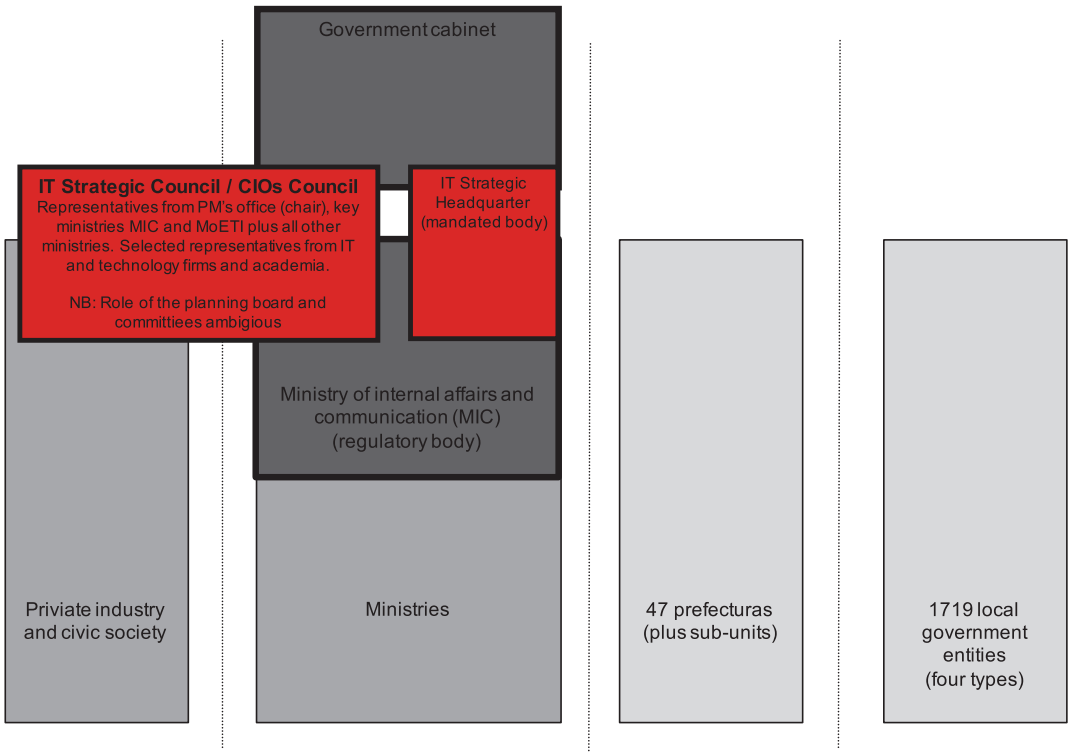
There is no clear link between the national eGovernment strategy and initiatives, and those at relation and local level. Similarly, there is no national IT programme and project model in place to ensure risk minimization and benefit realisation (ITSH - IT Strategic Headquarter 2016, Kantei 2016, JiJI 2017, MIC - Ministry of Internal Affairs and Communications 2017). That said, interviews with both central government actors (Interview 2 Japan 2016, Interview 3 Japan 2016, Interview 5 Japan 2016) and academics (Interview 1 Japan 2016, Interview 6 Japan 2016) indicate that most authorities form some sort of project management model. The Japanese eGovernance model is illustrated in Figure 4.

Figure 4: Organigram of eGovernment promotion in Japan since 2003 (MIC - Ministry of Internal Affairs and Communications 2017)



Stakeholders directly involved include key government agencies. Selected representatives from large IT and technology firms and academia are also invited to partake in the ITSC. Policy documents, official websites, and past research show that prefectures and municipalities are not represented in the ITSH, ITSC, planning board, or committees (ITSH - IT Strategic Headquarter 2016, ITSH - IT Strategic Headquarter 2016, Bureau 2017). Interviews with both government officials (Interview 2 Japan 2016, Interview 3 Japan 2016, Interview 5 Japan 2016) and academics (Interview 1 Japan 2016, Interview 6 Japan 2016), indicate that prefectures and municipalities are indirectly represented by the MICs Local Administration Bureau (LAB), which is responsible for regional decentralization, including ICT related issues, but has limited power to enforce actual compliance in situations where MIC or LAB are not the funding source. Interviewees highlighted that an ex-MIC and ITSH employee is now the major of Kurashiki City – a medium-sized city of 450.000 people in Okayama prefecture – and thus indirectly represents local government, but that it is an incidental rather than calculated decision (Interview 1 Japan 2016, Interview 3 Japan 2016). Interviews also confirmed that stakeholders, such as citizens and businesses, or small and medium sized IT companies, are not represented in the ITSC except though central government authorities (Interview 1 Japan 2016, Interview 2 Japan 2016, Interview 3 Japan 2016). The stakeholders involved in the Japanese eGovernance model is illustrated in Figure 5.

Figure 5: eGovernment governance and coordination model in Japan (source: author)



In conclusion, the relative consistent approach to eGovernance can be considered a strength. While the division of the mandatory and regulatory mandates on paper can be seen as a weakness, the physical location of the ITSH and ITSC (the mandated bodies) within the MIC (the regulatory body), and the high number of ITSH staff on loan from MIC and other ministries, all minimize the risk of conflict. The informal nature of these networks would benefit from formalization. While academia and private industry representation in the ITSC is a strength, the domination of large hardware and infrastructure companies should be diluted to ensure that also software and other ICT applications come to the forefront. A key weakness of the Japanese eGovernance model is the lack of direct regional and local government representation in both the ITSH and ITSC. Informal, indirect, and accidental representation by key public service providers should be formalized to ensure that the national eGovernment vision covers all levels of government. The annual evaluation of eGovernment initiatives is a strength of the Japanese approach, but the seemingly lack of measurable eGovernment objectives, which in turn can be linked to individual activities, remains a weakness when it comes to benefit realisation.

6. Internet Access, Key Enablers, Citizen eServices, and Use and Impact

Having outlined the eGovernment strategies of Japan and Denmark, as well as their respective governance and cooperation models, the question now is what the two countries achieved in terms

of internet access, key enablers and citizen eServices rolled-out (supplied), and whether these have led to the envisioned impacts (demand and use).

6.1. Internet Access and Use

Access to, and the skills to use, the internet are prerequisites for a successful eGovernment and the uptake of provided eServices. Both Denmark and Japan have successfully rolled out internet infrastructure, as illustrated in Table 7. The two countries have similarly high rates of mobile and broadband subscription rates (122.89%/42.75% and 129.75%/31.47% in Denmark and Japan, respectively). OECD data from 2014 shows that broadband prices are lower in Japan (at US$ 21.74 – 51.96) than in Denmark (at US$ 22.24 – 62.68, both adjusted to purchasing price parity). Japan also offers faster internet speeds and uses superior technology (such as FTTH, Fiber/LAN and fiber connections) than Denmark (OECD 2016).

Table 7: Number of mobile and broadband subscriptions per 100 inhabitants 2000–2016 (selected years) (ITU - Internet Telecommunications Union 2017)

	2000	**2005**	**2010**	**2015**	**2016**
Denmark	63,01 / 1,26	100,58 / 24,80	115,67 / 38,44	125.04 / 42.48	12.89 / 42.75
Japan	53,12 / 0,68	75,98 / 18,35	96,81 / 28,04	126.54 / 30.65	129.75/31.47

Similarly, government policies have facilitated the development of a digitally literate population and society (96.97% in Denmark and 92% in Japan, in 2016), as illustrated by the growth of internet use since 2000 in Table 8.

Table 8: Individual use of the internet per 100 inhabitants 2000-2016 (selected years) (ITU - Internet Telecommunications Union 2017)

	2000	**2005**	**2010**	**2015**	**2016**
Denmark	39,17	82,74	88,72	96,33	96,97
Japan	29,99	66,92	78,21	91,06	92,00

6.2. Key Enablers and eServices

Data for citizens' use of key enablers, such as electronic identities (eIDs), digital signatures and the volume of public service delivery online, is readily available for Denmark for the 2012-2016 period, but was more difficult to obtain for Japan, as illustrated in Table 9.

Table 9: Individual use of eServices 2000-2014, selected year, as a percentage of overall service volume (MIC 2012, NIA - National Tax Agency Japan 2015, Kantei 2016, DIGST - Digitaliseringsstyrlesen 2017)

	eService availability		**Degree of digitization (i.e. % of service delivery volume online)**					
			2012		2015		2016	
	Denmark	Japan	Denmark	Japan	Denmark	Japan	Denmark	Japan
eID / eSignature	NemID	yes	79.1	--	89.2	7.7	92	9.2
Digital post	Digital Post	no	--	--	89.2	--	90.1	--
Tax declaration simple/ expanded	yes/yes	yes	100/96	48.9	100/99	56.5[2]	100/99	58.6[2]
Register for school	yes	n/a	57	--	96	--	97	--
Register for university	yes	n/a	80	--	100	--	100	--
Apply for student grant / repay	yes/yes	n/a	100/54	--	100/92	--	100/923	--
Change address	yes	yes	63	0.0000 021	92	--	92	--
Housing subsidy	yes	n/a	77	--	79	--	79	--
Pension	yes	yes	94	--	95	--	95	--
Apply for national / EU health card	yes/yes	n/a	43/65	--	92/92	--	49 /92	--
Report vermin (fix my street)	yes	n/a	56	--	73	--	72[3]	--
Report theft	yes	n/a	41	--	84	--	84	--

While Denmark has monitored the degree of digitization under the previous eGovernment strategy, this was discontinued in January 2017 as the mandatory online self-service initiative was concluded. The final report shows that the collective degree of digitization was 87% (based on approx. 11.5 million transaction in the period). For central government services, the result was 91% (of 5.8 million service requests), for local government it was 80% (of 3.9 million service requests), and for UdbetalingDenmark service areas, 88% of volume (1.7 million service requests) were online by end of 2015 (DIGST - Digitaliseringsstyrlesen 2017). For Japan, data availability is limited. While data may be collected by individual authorities, this is not coordinated, is rarely comparable (due to different methodologies), and is not collected centrally. Even data on the high profile MyNumber in difficult to come by. This lack of data also makes it hard for the ITSH and ITSC to monitor developments and progress, as confirmed by interviews with both government officials, the coordinating body, and supported by academics. (Interview 1 Japan 2016, Interview 3 Japan 2016, Interview 4 Japan 2016, Interview 6 Japan 2016).

When seeking alternative generic data for the proportion of citizens use of online banking (eBanking), online purchases (eCommerce), and their level of interaction with public authorities online, this data was mainly identifiable for Denmark, as illustrated in Table 10. Interviews with both government officials (Interview 2 Japan 2016, Interview 3 Japan 2016, Interview 4 Japan 2016, Interview 5 Japan 2016) and academics (Interview 1 Japan 2016) confirm that data is not systematically collected in Japan by either the ITSH, other authorities, or the statistical services.

Table 10: Citizens use of eBanking, eCommerce and interaction with public authorities online 2000–2016 (at least once per year), selected years (Eurostat 2017)

	2010		**2015**		**2016**	
	Denmark	Japan	Denmark	Japan	Denmark	Japan
Online banking	71%	--	85%	16%[2]	88%	--
Online commerce	68%	49%[3]	79%	52%[7]	82%	--
Interacted with government online	78%	13%	88%	--	88%	--
Obtained info. from gov. website	76%	--	86%	--	85%	--
Submitted a complete form (eService)	51%	--	69%	--	71%	--

[2] Figure varies from 13% to 16% depending on source. Mode of contact defined as mobile phone Kawamoto, S. (2015). Internet banking slow to take root in nation where branches offer friendly face time. The Japan Times. Tokyo, The Japan Times.

[3] Online commerce figures based on a different collection methodology and from 2010 and 2014 OECD. (2016). "ICT access and use by individuals." OECD.Stat Retrieved 29 June 2016, 2016, from http://stats.oecd.org/.

While both Denmark and Japan are included in the international eGovernment indexes of the United Nations and Waseda University, neither index addresses the actual use of the online services that are offered (Obi 2016, UNDESA - United Nations Department of Economic and Social Affairs 2016). The biannual UNDESA eGovernment Readiness Index covers both human capacity (i.e. HCI – Human Capacities Index), technology and infrastructure availability (i.e. TII – Technical Infrastructure Index), and the availability of specific types of online content and transaction (i.e. OSI – Online Service Index). The rank of both Denmark and Japan are consistently in the global Top 20, as illustrated in Table 11. The difference seems to be explained mainly by the human capacity score, which is consistently higher in Denmark for the 2010-2016 period. By comparison, Japan has been catching up with Denmark and slightly outperforming Denmark in the 2016 edition. This is more or less consistent with the findings in section 5.1. and the data in Tables 7 and 8. That Japan is outperforming Denmark in the online service index is surprising in relation to the online service use data in Tables 9 and 10, and the limited take-up of the high-profiled MyNumber eID/digital signature in Japan (JiJI 2017). Three reasons may explain the Japanese OSI score: first, the UNDESA OSI is supply-orientated and thus does not measure actual use of public or private sector services; second, the OSI included open data availability, an area in which Denmark has not had a particular focus on, while Japan has had an open data strategy since 2012 (ITSH - IT Strategic Headquarter 2012); third, the OSI only addresses a select number of central government website, whereas local government is responsible for +70% of service delivery in both Denmark and Japan.

Table 11: UNDESA eGovernment Readiness Index, 2010-2016 (UNDESA - United Nations Department of Economic and Social Affairs 2010, 2012, 2014, 2016)

	2010		**2012**		**2014**		**2016**	
	Denmark	Japan	Denmark	Japan	Denmark	Japan	Denmark	Japan
Rank	7	17	4	18	16	6	9	11
EGDI – eGov. Devl. Index	0.7872	0.7152	0.8889	0.8019	0.8162	0.8874	0.8510	0.8440
HCI – Human Capacity Index	0.9933	0.9496	0.9489	0.8969	0.9132	0.8621	0.9530	0.8278
TII – Technical Infra. Index	0.6988	0.5242	0.8615	0.6460	0.8740	0.8553	0.8247	0.8277
OSI – Online Service Index	0.6730	0.6730	0.8562	0.8627	0.6614	0.9449	0.7745	0.8768

The Waseda Index covers network preparedness, eService and national portal availability, and some management and governance issues. Based on the data in Table 12, Denmark generally outranks Japan in the Waseda Index. For 2016, Denmark outperforms Japan in all but Government CIO and eGovernment promotion subcategories (similarly in 2012 and 2015). This is particularly interesting as the eGovernance model in Denmark seems to have achieved better outcomes in relation to infrastructure roll-out and online service use, and similar results for mobile and

broadband subscriptions. Explanations for this include: first, the supply-orientated methodology of the Waseda Index, which does not consider take-up of eService and benefit realization (remember that e.g. the 2016 take-up of the Japanese MyNumber was an estimated 9.2% compared to 92% for the Danish NemID equvilent); second, the Japanese eGovernance model is anchored in the Cabinet Office, while the Danish is a specialized agency within the Ministry of Finance; third, the Danish model is more complex in nature as it covers all levels of government, while Japan's focuses on central government ICT use.

Figure 12: Waseda Index for eGovernment, 2012-2016 (Obi 2012, 2015, 2016)

	2012		**2015**		**2016**	
	Denmark	Japan	Denmark	Japan	Denmark	Japan
Overall eGovernment ranking	5 (86.5)	8 (81.5)	3 (91.25)	6 (87.77)	3 (88.8)	5 (83.2)
Network preparedness	3	<10	1	<10	1 (7.9)	7 (7.4)
eServices/interface (selected services)#	4	9	1	9	2 (11.2)	9 (7.8)
Portal (i.e. national one-stop-shop)	7	7	2	<10	2 (7.3)	<10 (4.7)
Management optimization	8	10	6	4	1 (11.8)	4 (11.5)
Government CIO (i.e. governance aspect)	<10	5	5	8	5 (8.4)	2 (9.1)
eGovernment promotion (i.e. strategy)	9	4	8	5	4 (8.3)	2 (9.3)

** Score for criteria and sub-criteria are not available online.*
#Title of criteria changed from 2012 "required interphase/application" to "online service" in 2015.

7. Comparative Analysis and Conclusions

Focusing on electronic service provision (eServices) and eGovernment achievements in Japan and Denmark, Meyerhoff Nielsen and Igari (Meyerhoff Nielsen and Igari 2012) identified governance and intergovernmental cooperation as key factors for a successful eService supply and citizen take-up. Japan, generally, had a better infrastructure than Denmark, but lacked unique identifiers for individuals, businesses, property, and national one-stop-shops for services. Denmark's unique identifiers and digital signature systems, such as the population register (the CPR registry) and business register (the CVR and BBR registries), enabled the creation of user-centric web services on thematic portals, for example, Borger.dk, Virk.dk or Sundhed.dk (national portals for citizens, businesses, and health, respectively) (Meyerhoff Nielsen and Igari 2012). The comparatively higher

level of strategic governance and intergovernmental cooperation in Denmark suggests their importance for the successful roll-out and subsequent citizen use of eServices.

While Japan continues to have a more complex institutional framework and approach to governance, intergovernmental cooperation is seemingly also less entrenched in Japan, as illustrated by taxation. In relation to eGovernance, Japan had a relatively stable institutional framework since the early 2000s. Denmark, by comparison, has gone through cycles of evaluation and adjustment with each eGovernment strategy. While stability can be seen as a strength, the continued self-reflection and improvement in Denmark has led to a strong central mandate, which is used only when consensus and cooperation fails. In fact, the relative Danish advantages in relation to national standards, such as interoperability and enterprise architecture first identified by Meyerhoff and Igari in 2012 (Meyerhoff Nielsen and Igari 2012), continues to apply. Similarly, the observed advantage in relation to shared key enablers, common components, reuse of data, common look-and-feel across online government platforms and services, user-centric and user-friendly online services participatory design and testing, has manifested as even bigger weaknesses in Japan, as seen by the slow take-up of the high-profile MyNumber initiative and continued discussion about the introduction of a national interoperability framework.

To compare the two national approaches to eGovernance and inter-governmental cooperation, Tables 13 and 14 enable a comparison of Danish and Japanese approaches to cooperation in relation to the policy (i.e. vision and strategy setting) and operational levels (i.e. implementation). Both Japan's ITSC and ITSH, and Denmark's DIGST, are deemed to have real influence in relation to setting the political agenda regarding ICT use and eServices. This is confirmed by both desk research and interviews with different stakeholders in both countries. Where the two countries differ is in relation to the operational level and the implementation of the national vision and strategy. In Denmark, the PSC for the eGovernment strategy, and DIGST within the MoF, established the holistic political direction, horizontal and vertical leadership, strategies, and coordination required for joint initiatives and cooperation between national, regional and local authorities, therefore giving citizens and businesses a sense of institutions speaking with a "single voice". Similarly, the formalization of steering committees and working groups with the 2016 strategy ensures that conflict resolution, essential coordination between initiatives, re-prioritisation of initiatives, budgets and even coordinated resolution of legal challenges is entrenched in the governance and cooperation model. By comparison, Japan's Government CIO and ITSH have long had a formal annual process for re-evaluation and re-prioritisation of strategic initiatives at central government level – as illustrated by updated policy documents. Japan's Government CIO and ITSH is similarly tasked with coordination, but are not given the mandate to ensure compliance when faced with conflicting interests.

Table 13: Denmark's eGovernance and coordination model since 2016 (source: author)

	Co-ordination of the implementation of strategy	Wider co-ordination of the development of information society
Vision	*DIGST and the PSC*	*DIGST facilitated consultation*
Strategy	*DIGST and the PSC*	*DIGST facilitated consultation*
Implementa-tion of action plans	*DIGST Programme and project steering committees PSC for escalation*	*DIGST Programme and project steering committees*
Daily implementa-tion and everyday work	*Programme and project steering committees Individual Ministries and authorities*	*Programme and project steering committees*

Table 14: Japan's eGovernance and coordination model since 2003 (source: author)

	Co-ordination of the implementation of strategy	Wider co-ordination of the development of information society
Vision	*ITSH*	*ITSH, ITSC*
Strategy	*ITSH*	*ITSC, MIC/LBA*
Implementa-tion of action plans	*ITSH and PMO units*	
Daily implementat-ion and everyday work	*ITSH and PMO units Individual Ministries and responsible agencies*	

The Danish cross-governmental model revolves around the PSC within DIGST and the Ministry of Finance. The PSC creates horizontal connections across the central government agencies, as well as vertical connections among the central government, regions, and municipalities. Joint initiatives and cooperation between public authorities at all levels of government gives citizens and businesses a sense of the government and institutions speaking with a "single voice". While public-private cooperation and projects do exist (e.g., the digital postbox, eID and eSignature), there could be better civil society and private sector representation – the latter is partially seen in Japan since the establishment of the ITSC in 2002 – in the joint-steering committee to ensure that the public sector cost saving agenda also benefits citizens and businesses (e.g., through administrative burden reduction and user-centric and proactive service delivery). An unfortunate aspect of the current 2016–2020 strategy is the vague formulation of measurable outcomes and KPIs – a change from the previous strategic periods' very ambitious goals.

Although Japan's ITSH is a cross-agency, cross-staffed organization, its political influence, agenda setting role, budget and leadership, are all weak compared to its Danish counterpart. Despite annual priority policy programs supporting the strategic objectives of the eGovernment strategies, there is limited evidence of an actual benefit realization in strategic initiatives – the

repeated delay of the decision to introduce a unique personal identifier is a key example of this challenge. Japan's 2016–2020 strategy does address the need for a more coordinated approach to governance and intergovernmental cooperation, monitoring of progress, and KPIs, but as seen in section 6, data is only sporadically available and lacks measurable objectives in many ICT related strategy documents (Kantei 2015, ITSH - IT Strategic Headquarter 2016, ITSH - IT Strategic Headquarter 2016).

To analyze the difference between the governance and cooperation models further, Figures 6 and 7 outline the formal and informal structures of importance in Denmark and Japan. In the case of Denmark, no informal networks are indicated. The interviews confirm that they tend to mirror and compliment formal structures, in contrast to Japan.

Figure 6: Organigram of Denmark's eGovernance and coordination model since 2016 (source: author)

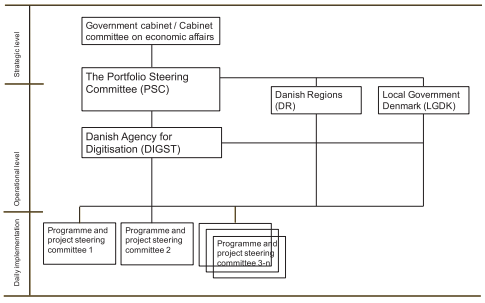
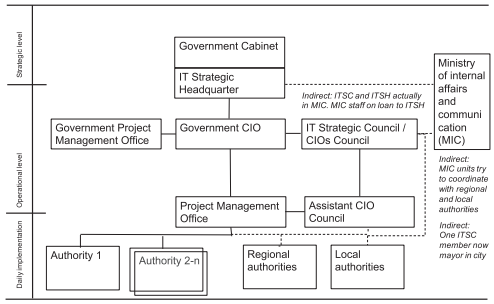


Figure 7: Organigram of Japan's eGovernance and coordination model being implemented in 2003 (source: author)



The role of personal contacts and informal networks in Japan comes to light in different ways. While spilt between the mandate in the ITSH, the chairpersonship of the ITSC and Japan's MIC regulatory responsibility is, in theory, a source of potential conflict. In reality, both the ITSH and ITSC are located in MIC buildings and a large number of MIC staff are on loan to the ITSH. Interviews confirm that personal contacts and informal networks ensure coordination between different ITSH, ITSC and MIC interests, as illustrated in Figure 7. Similarly, local government is represented in the ITSC by lucky coincidence; that is, the election of a former MIC and ITSH employee to be Mayor, who has since become a member of the ITSC. Similarly, the LAB coordinates with prefectures and municipalities, but the sporadic availability of eServices at local government level for, e.g. limited take-up of MyNumber, change of address, registration for school, daycare etc., indicates that it is not always successful. The complex structure of public administration in Japan is also seen as a barrier by a number of sources and interviewees.

As observed in 2012, this analysis shows that the Danish approach continues to prove its worth, not only in providing the strategic direction, but also by delivering real and measurable results of digitization. The Japanese model has been more ambitions and successful in infrastructure rollout, open data and piloting new technologies like artificial intelligence, but has yet to deliver similar measurable results in the area of such as interoperability, eIDs and public sector services. While initially delayed, Japan is now rolling an eID (i.e. MyNumber); similarly, the volume of online tax

submissions is increasing, and the country has a vibrant open data community. The comparatively weak mandate, complex set-up, lack of cross-governmental cooperation, lack of prefecture and municipality representation in Japan seems to continue to limit measurable progress in relation to cross-governmental and citizen-orientated initiatives. The general lack of background and effect indicators for Japan is unfortunate, however, highlights a limited focus on measurable objectives and/or lack of management focus when it comes to the strategic focus on citizen eServices. Unfortunately, the mandate of the new government CIO only allows for the coordination and does not have the power to ensure a systematic approach to monitoring and measurement of the strategies and initiatives, implementation, and KPIs.

8. Conclusions

In conclusion, and in relation to Meyerhoff Nielsen and Igari's 2012 findings (Meyerhoff Nielsen and Igari 2012), these still hold. Subsequent analysis of existing academic research, policy documents and websites (Meyerhoff Nielsen 2016), and interviews with actors and stakeholders, have added additional insight to the respective national models for governance and intergovernmental cooperation.

Japan can still learn from the Danish approach in a number of ways. The governance structure and mandate of Japan could be strengthened, and while the current 2016–2020 strategy emphasizes greater coordination, monitoring and measurable outcomes are yet to be proven in practice. Similarly, representatives from regional and local authorities should be included in the ITSC, especially as the current strategy included the regional and local roll-out of successful national initiatives, use of national ID cards, and eIDs. Although the initiatives on standardized formats and processes, shared components and contents, involvement of end-users in developing value adding, personal and user-friendly services based on the eID, and open data initiatives are highlighted by the 2016–2020 strategic period, it remains unclear whether their promise will be realized.

The Danish adjustment introduced with the 2016-2020 strategy is positive in relation to the strengthened mandate of the PSC, the creation of the standing committees on legal and budgetary issues, and a more structured approach to steering committees and working groups on the operational level. In relation to stakeholders involvement, the Japanese involvement of representatives from the private sector and academia should be of inspiration to the Danish coordinating agency. While the private sector and academia representatives in the PSC may not be practical in relation to day-to-day operational decisions, it would be beneficial to draw on their expertise and knowledge – particularly when developing new strategies and initiatives. Valuable private sector and academia contributions could be provided on emerging technologies, such as artificial intelligence and block chain, and concepts, such as Smart cities and Internet of Things, on ways to minimize risk emerging in initiatives – or even act as a form of peer review mechanism during a strategy period. Similarly, more transparency in the consultation process for news strategies and action plans have the potential to further increase local government co-ownership. Also, Denmark could also be inspired by the Japanese approach to piloting new technologies, opening data for reuse by civil society and the private sector, with Denmark being the positive example and Japan being relatively less successful as a result of the limited inclusion of regional

and local government actors. A relatively weak mandate of the government CIO to ensure compliance with national strategies is also to blame here

In short, both the Danish and Japanese cases add insight to the role that *a strong governance model and high level of intergovernmental cooperation lead to the successful supply and use of online citizen services.* In fact, both cases show that a *strong governance model lead to (i) supply and (ii) use of online services (i.e. Hypothesis 1),* with Denmark being the positive example and Japan being relatively less successful as a result of the limited inclusion of regional and local government actors, together with a relatively weak mandate of the government CIO to ensure compliance with national strategies. Similarly, the Danish case illustrates that *a high level of intergovernmental cooperation lead to (i) supply and (ii) use of online services (i.e. Hypothesis 2)*, but that the cooperation must be on related supply issues (e.g. availability of internet, eIDs, eServices), the coordinated promotion and monitoring of actual use of supplied eIDs and eServices. By comparison, the limited cooperation between levels of government in Japan have led to a more fragmented approach to the development of a national eID solution and eServices at different levels of government. The two cases both support *a strong coordinated link between national vision, strategy, action plan and initiatives leads to lead to (i) supply (ii) use of online services (i.e. Hypothesis 3).* While the Danish case illustrated the benefit in relation to the supply and citizens actual use of eServices, the Japanese case illustrated in relation to the achievements of ultra-fast broadband. The lack of a coordinated vision and strategic focus, e.g. eID take-up and cross-governmental promotion of existing online service offer, have led to a diametrically different outcome in Japan.

In conclusion, the two cases provide insight on the role that governance and intergovernmental cooperation plans in relation to the successful provision and use of online citizen services in two countries with different organizational set-ups and traditions. In order to explore if the working hypothesis will hold in other socio-economic and organizational contexts, the author will attempt to answer the same question in relation to: Georgia, a low-income nation state with regional differences and limited local government capacities but increasing service delivery; Estonia, a small, middle-income nation state with a centralized government and limited service delivery and capacities at local level, and; the Faroe Islands, a high-income, centralized, micro-dependency with large autonomy given to local authorities, including for public service delivery.

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Article IV

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The Role of Governance, Cooperation, and eService Use in Current eGovernment Stage Models

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Abstract

With a classical literature review of research on public sector reform, IT governance, and eGovernment, this article aims to identify the role of governance and cooperation in the public sector's implementation and actual use of citizen eServices. Thirty-four eGovernment stage models with 11 overarching stages and five metacharacteristics are identified, mapped, and reviewed for their focus, strengths, and weaknesses. Results highlight two gaps in current research: one, that the role of governance and cooperation in ensuring the successful supply and use of online eServices is not addressed, and two, that current models address only supply-side, technological, and organisational issues.[1]

1. Introduction

International benchmarking research [1-3] and case studies [3-6] have long examined the introduction of information communication technology (ICT) in public administration (PA), while governance and cooperation have often been the subjects of academic discourse on PA, particularly those concerning ICT-enabled public sector reform [7-11], information systems (IS) management research [10, 12-16], and the increasingly independent field of electronic government and governance—that is, eGovernment and eGovernance [17-19]. Other authors, however, have stressed research's failure to address specific issues, including blindly digitising current processes [20-22], technology and supply [23-25], and the outcome and impact of ICT use [9, 26, 27]. In response, by focusing on national eGovernment strategies and online citizen services, this article identifies and reviews current stage models to assess whether and how they address governance, cooperation, and takeup.

Stage models (i.e., maturity models) are predefined, conceptual multistage models that describe typical development patterns and progress, which in research on IS involves the assessement of software development processes and organisational capabilities [15, 16]. Literature addressing eGovernment often discusses generally introducing ICT into PA [28, 29] and, along with studies of IS management, has used stage models for benchmarking. In contribution, this article first explores literature concerning PA, IS management, and eGovernment in order to identify the most relevant focus for the article's literature review (sec. 2). The method (sec. 3) and findings of the review are discussed (sec. 4, 5) before the article concludes by recommending future research directions (sec. 6, 7).

2. Background

Research on ICT use in PA, such as by Bannister [26], Brown [12], Heeks [17], Judic et al. [30], Scholl [31], and Yildiz [32], illustrate the shifting focus of academic discourse from measuring and evaluating ICT maturity in PA toward analyzing preconditions and contextual issues (e.g., awareness, digital divide, trust, and infrastructure). The focus then shifted again to evaluating the availability of eGovernment services (e.g., in terms of supply and maturity), the actual use of eGovernment solutions (e.g., in terms of demand, usage, interest versus use, and factors affecting use), and eGovernment impacts (e.g., in terms of effectiveness, efficiency, and equity). Decision making (e.g., eParticipation and eDemocracy) and innovative uses of ICT in smart cities have also received sustained attention.

Though the US National Performance Review coined *electronic government* in 1993 and *eGovernment* became prominent around 1997 [17], ICT has played a role in public sector service delivery since the mid-20th century, as Gammon's 1954 review of the public sector's automatic handling of paperwork shows [33]. In the present article, *eGovernment* refers to "the use of ICT and its application by government for the provision of information and public services to the people" [1]. Meanwhile, *electronic governance* (i.e., *eGovernance*) encompasses all processes of

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governing, whether undertaken by a government, market forces, social networks (e.g., families, tribes, professionals), formal or informal organisations, a geographical territory, or via laws, norms, power, or language [1]. Thus, *governance* refers to what governing bodies responsible for eGovernment do to ensure success, while *cooperation* refers to activities engaged by various parties toward a shared purpose. In public sector service delivery, governance and cooperation are crucial for many reasons. One estimate indicates that good IT governance enables top-performing companies to generate up to 40% greater returns than competitors on the same ICT investment [34]. However, this article focuses on goverance not in given organisations but in PA as a whole.

2.1. ICT-enabled PA reform

In literature addressing PA, ICT is generally conceived as a tool to rationalise current processes or to rethink the public sector and re-engineer its processes and organisations [9]. Whereas the idea of using ICT to increase public sector performance and efficiency remains associated with research advocating new public management (NPM) [9, 35, 36], joint-up government (JUG), also known as (e)Government 2.0 or collaborative public management, aims to reintegrate public sectors fragmented by NPM reform [9, 18, 37, 38]. Lips's definition of PA 2.0 [24] suggests dropping the "e" to accommodate the complex, dynamic non-technical and contextual aspects of PA reform, while Bannister highlights ICT's capacity to transform the public sector by creating JUGs in which technology supports intergovernmental collaboration and coordination [21, 22]. Yet, classical PA literature fails to merge NPM and JUG and to address the role that governance plays in introducing ICT in PAs with measures for maturity and takeup.

2.2. IS management

Literature on IT governance and IS offers diverse definitions and sematic variations in its terminology [12]. Defined most simply, *IT governance* refers to frameworks in which decision rights and accountabilities encourage desirable behavior in IT use [30]. This definition aligns with this article's earlier definition of *governance*: what governing bodies responsible for eGovernment do to ensure success. From this, two parallel strands dominate literature on IT governance; one focuses on forms of IT governance, the other on IT governance contingency analysis.

To define their various structural forms, Brown and Grant [12] have summarised IT governance models. Moving from debate on the merits of centralised versus decentralised designs, researchers have explored less rigid alternatives modelled on the operational realities of public sector organisations, including vertical and horizontal integration and centralised, federal, and decentralised forms of government. By contrast, IT governance contingency analyses unanimously agree that no universal best practice IT governance structure exists [10, 12], meaning that the research focuses on factors influencing the adoption of particular IT governance models, the role of actors, organisational maturity, resources, the rank and location of responsible executives and steering committees, risk adversity, and the degree of centralisation [12].

During the last 40 years, a recurring subtopic in this literature has been staged maturity models: models that morphed into capability maturity models (CMM) for assessing software development processes in the 1980s and, since 2002, the integration of product and service development, management, and acquisition [16, 39]. While some IT governance models, such as the US Federal Enterprise Architecture [40] and Chilean CMMI-inspired eGov-maturity model and toolkit [14], address political and legal dimensions, most focus on business processes in single organisations, not the cross-organisational, national, or international ones of PA and eGovernment [41].

2.3. eGovernment and eGovernance

Similar to research on PA, studies of eGovernment show two dominant avenues of thinking: using ICT as a tool to either increase the efficiency of existing processes or radically transform governmental functioning [9]. In seeing the role of ICT in PA as evolving, Lips [24], Millard et al. [18, 42], and Traunmüller and Wimmer [20] reflect this trend.

In eGovernment literature, a recurring theme is using stage models to map capabilities, maturity, and progress. Layne and Lee [29], West [43], Moon [44], Heeks [11], Andersen and Henriksen, [27], Wimmer [20], and Klievink and Janssen [45] have all reported the usefulness of stage models as tools to guide decision makers and spur the development of capabilities that countries need to shift from one stage to another, albeit from different perspectives. Meanwhile, critism of stage models cites their simplistic, generic, sequential, and technologically deterministic view on development, lack of solid theoretical foundations [46], lack of citizen perspectives [27], failture to address the role of management in benefit realisation and risk mitigation [47], and lack of emperical evidence validating normative models [46, 48].

In short, eGovernment stage models seem to lack a clear link between supply and outcomes and between

governance's role in the successful implementation and subsequent use of ICT and eServices solutions, as the CMMI model exemplifies [46].

2.4. Other streams of discourse

Added to academic discourse, international organisations, including the European Union (EU), Organisation for Economic Co-operation and Development (OECD), and United Nations (UN), have published relevant studies and data. The 2014 EU digital scoreboard [49] and UN eGovernment survey [1] highlight the rapid rise in Internet use (72% in the EU) and the provision of high-speed broadband over time (62% in the EU).

The EU, OECD, and UN have usually focused on the availability of Internet and eServices, key technical enablers of eGovernment such as data registries, and unique identifiers and electronic identification (eID) [49]. Recently, however, the focus has shifted to other critical enablers: effectiveness [4], accountability [1], transparency, user-centricity, and whole-of-government (or JUG) [49]. Yet, the mere introduction of technology does not guarantee success or the creation of additional value. Increasing the use of digital service delivery channels, efficiency, and effectiveness presents a persistant challenge, as exemplified in Japan, where ICT infrastructure is well established, though actual use and efficiency gains have been limited, if not stagnant, due to fragmented organisational and governance structures [50-52].

2.5. Research strands and potential gaps

Most evaluations (esp., benchmarks, indexes, and rankings) focus on technology and the supply side, thus failing to explain discrepancies between the availability (i.e., supply) and use (i.e., demand) of online public services [50, 51]. In response, Wimmer [20], Leitner et al. [6], Huijboom et al. [18], Millard [3], and Bannister [22] highlight the need for a holistic approach, while Brown [12] recommends a merger with classical IT governance strands of thinking.

The importance of governance models and outcomes is illustrated by the discrepancy between Denmark's and Japan's online address changes. Though more than 80% of address changes in Denmark are made online, the figure is only 0.0002% in Japan [51]. Statistical analysis fails to shed light on the underlying reasons why more Danes use the Internet to interact with PA (85%) than the Dutch and Swedes (79% and 78%, respectively), though similar amounts of households—all in the 90+ percentile—in those countries pay for Internet access [49, 50, 53]. Given these challenges, the OECD adopted several recommendations for public sector digitisation and eGovernment strategies [4]. Those from July 2014 address strategic directions of eGovernment, implementation, governance, and cooperation models. OECD recommendations stem from the realisation that introducing ICT infrastructure and online services for improved public sector efficiency and effectiveness requires more than only supply [4, 35].

These practical examples from a brief review of the literature hint at potential limitations in current research. This article thus reviews literature on eGovernment stage models to see whether they indicate why countries with similar infrastructures and eService availability experience show different levels of online interaction with the public sector.

3. Method

Current literature reveals two potential gaps in current eGovernment and governance research, which to confirm involved conducting a literature review to establish whether eGovernment stage models address how and how well governance and cooperation models ensure the successful supply and use of online citizen services and whether these models are practical tools for measuring the successful digitisation of public sector service delivery and eService takeup by citizens. The review followed the traditional pattern for systematic information retrieval outlined by Roberts [50] and Walsh and Downe's [51] qualitative metasynthesis procedure. Walsh and Downe's seven-step model was adapted to include "berrypicking" [52].

Literature was reviewed using keyword searches (i.e., *eGovernment stage* or *model*, *level*, *tier*, or development) on Web of Science [53], Scopus [54], and the E-Government Reference Library version 10.5 [55]. Complimentary sources include Google Scholar, ResearchGate, and non-academic reports related to stage models, benchmarks and rankings, and key documents. To frame and define review parameters, only English-language studies of at least seven pages published by peer-reviewed academic conferences, academic journals, or international bodies after 1 January 1995 were considered.

Models were compared in a mapping exercise to identify homogeneity or heterogeneity, strengths, and weaknesses toward pinpointing potential gaps in the literature that future research on stage, cooperation, and governance models can fill for the successful introduction and use of eServices. Since models identified stemmed from diverse perspectives and used different definitions and metaphors, they were difficult to summarise and compare. In response, the identified stages were distilled using Lee's qualitative metasynthesis framework [54] of five general

metaphors defined in table 1: presenting, assimilating, reforming, morphing, and eGovernance.

Metaphor	Description	Stages / concepts	
		Citizens and services	*Operation and technology*
Presenting	Presenting information in the information space	Information	
Assimilation	Assimilates (or replicates) processes and service in the information space with the ones in the real world.	Interaction	Integration
Reforming	Reform the processes and services in the real world to match the information space requirements, fitting for efficiency	Transaction	Streamlining
Morphing	Change the shape and scope of processes and services in the information space as well as the ones in the real world, fitting for effectiveness	Participation	Transforming
eGovernance	Processes and services in both worlds are synchronously managed, reflecting citizen-involved changes with reconfigurable processes and services	Involvement	Process management

Table 1. Metaphors, descriptions, and stages [54]

4. Stage and governance models

Layne and Lee call the experiences of eGovernment chaotic and unmanageable and stress dividing development into distinct stages [29]. To this effect, eGovernment research has largely focused on stage and maturity models. Researchers, consultants, national authorities, and international organisations offer several maturity and stage models that academics classify in three types: governmental models, holistic approach models, and evolutionary eGovernment maturity models [55, 56]. The present literature review focuses on governmental and evolutionary stage models, since the holistic maturity model approach focuses on project implementation and organisational capabilities, and particularly relevant in relation to IS management and CMM literature [15, 16, 57]. Using the method outlined in sec. 3, 34 stage models are identified that the following subsections cluster based on their characteristics.

4.1. Stage models by origin and type

The origins of the 34 stage models stem from either national authorities such as auditors or international organisations such as the EU or UN, consultancy firms such as Deloitte and CISCO, or academic groups. Table 2 presents the number of models identified for each of these four categories.

The first model was published by the Australian National Auditing Office in 1999 [57] and the latest by Heeks in 2015 [58]. By year of publication, the timeline in table 3 highlights numerous developments.

The first models emerged from national authorities, international organisations, and consultancies. National models from the Australian ANAO [57] to the UK equivalent were published in 1999–2001. International organisations followed, with the UN [59] in 2001 and the EU [2] and World Bank in 2002 [60, 61], while Deloitte [62] through the Accenture models [63] were published in 2000–2003. In chronological order, the first scientific models were published by Hiller and Belanger [64], Howard [65], Layne and Lee [29], and Silcock [66] in 2001 and by Wescott [67], Chandler and Emanuel [68], Moon [44], and Netchaeva [69] in 2002. The most recent models are of Dias and Gomas [70] in 2014 and Heeks [58] in 2015. The literature review also show that stage models were of great interest, especially in academic circles, in 2000–2002, when 15 of the 34 identified models were published.

Type	Quantity	Name
National	3	ANAO [57], SAFAD [57], UKNAO [71]
International	3	UN [1, 28], EU [2, 49], WB [60]
Consultant	4	Deloitte [62], Gartner [72], Accenture [63], Cisco [73]
Scientific	24	Hiller and Belanger [64], Howard [65], Layne and Lee [29], Silcock [66], Wescott [67], Chandler and Emanuel [68], Moon [44], Netchaeva [69], Reddick [74], Waseda [75], West [43], Windley [76], Persson and Goldkuhl [57], Siau and Long [77], Andersen and Henriksen [27], Chan et al. [78], Shahkooh et al. [79], Almazan and Gil–Garcia [80], Kleivink and Janssen [45], Kim and Grant [81], Alhomod et al. [61], Lee and Kwak [82], Dias and Gomes [70], Heeks [58]

Table 2. Stage models by origin and name

Model	Type	Experiences/case study
ANAO	National	Australian experience
SAFAD	National	Swedish experience and ANAO model
UKNAO	National	UK experiences
Accenture	Consultant	Observations in 22 countries; annual ranking
UN	International	Observations in 193 countries
EU	International	Observations in 28 EU countries and associated member states; based on SAFAD model; annual ranking of countries
Layne and Lee	Scientific	Observations in the US
Moon	Scientific	Case study of 2,000 US municipalities
Reddick	Scientific	Observations in US municipalities
Wescott	Scientific	Observations in Asian Pacific countries
Waseda	International	Observations in multiple countries; annual ranking
West	Scientific	Case studies from 1,813 and 1,680 US municipalities in 2000 and 2001 plus observations in multiple countries (e.g., in 2006)
Windley	Scientific	Case study of US Utah.gov
Andersen and Henriksen	Scientific	Case study of 110 Danish stage sites and Layne and Lee's model
Chan et al.	Scientific	Case study of selected Chinese regional portals
Almazan et al.	Scientific	Case study of 32 Mexican state portals
Dias and Gomes	Scientific	Case studies of 239 Portuguese municipalities in 1999, 2007, 2010, and 2013
Lee and Kwak	Scientific	Observations in US health sector

Table 3. Case study-based stage models

Name / author of model	Year of publication	# of stages in the model	Pre-conditions (0)	Presenting (1+2+3 / Lee presenting)	Transaction (4+5 / Lee assimilation,	Reforming /User-centric (6+7+8 / Lee Reforming)	Morphing / Personal (9 / Lee Morphing)	eDemocracy (10 / Lee eGovernance	Ranking/ index/ benchmark/ evaluation	
ANAO (Australian National Audit Office)	1999	4		2+3	4+5	6+7				
Deloitte Research	2000	6		2+3	4+5	7+8				
Gartner Group	2000	4		2+3	4+5	6+7+8	9			
SAFAD (Swe Agency for Admin. Development)	2000	4		2+3	4+5	6+7+8				
Hiller & Belanger	2001	5		2+3	4+5	6+7+8		10		
Howard	2001	3		2+3	4					
Leyne & Lee	2001	4		2	4+5	6+7+8				
Silcock	2001	6		2	4+5	6+7+8	9			
United Nations	2001-	4	0	2+3	4+5	6+7+8		(10)	x	Cluster 1
Wescott	2001	6		1+2+3	4+5	6+7+8		10		
Chandler & Emanuel	2002	4		2+3	4	7+8				
EU	2002	7	0	2+3	4+5	6		(10)	x	
Moon	2002	5		2+3	4+5	6+7+8		10		
Netchaeva	2002	5		2+3	4+5	6+7+8		10		
UKNAO (UK National Audit Office)	2002	5		2+3	4	6+7+8				
World Bank	2002	3		2+3	4+5	6				
Accenture	2003	5		2	4+5	6+7	9			
Reddick	2004	2		2+3	4+5	6				Cluster 2
Waseda	2004-	5	0		4	7+8		10	x	
West	2004	4		2	4+5	6+7+8		10	x	
Windley	2004	4		2+3	4+5	6+7+8	9			
Siau & Long	2005	5		2+3	4+5	6	9	10		
Persson & Goldkuhl	2005	2		1+2+3	4+5	6+7+8	9	10		
Andersen & Henriksen	2006	4		(1)+2+3	4+5	6+7+8	9	(10)		
Cisco	2007	3		3	4	7+8	9			
Chan et. al.	2008	5		2+3	4+5	6+7+8	9			
Shahkooh et. Al.	2008	5		2+3	4+5	6+7+8		10		
Almazan & Gil-Garcia	2008	6		1+2+3	4+5	6+7+8		10		
Kleivink & Janssen	2009	5				6+7+8	9			
Kim & Grant	2010	5		2+3	4	6+7+8	9	(10)		
Alhomod et al	2012	4		2+3	4	8				
Lee & Kwak	2012	5		2+3			(9)	10		
Dias & Gomes	2014	12 / 3		1+2+3	4+5			(10)	x	
Heeks	2015	7 / 2 domains		2+3	4+5	6+7+8	9			

Table 4. 34 stage models, 11 metastages, and 5 metacharacteristics using Lee's qualitative metasynthesis framework

As table 3 shows, 18 of 34 of the identified models are based on practical experiences and case studies. Ten models are based largely on observations of ICT use in a single country or certain governmental PA and seven others on experiences in multiple countries (i.e., Accenture, UN, EU, and Wescott, West, SAFAD and Andersen and Henriksen on two countries). In contract Windley's, Chan et al.'s, and Almazan et al.'s models are based on regional observations in a single country, whereas those of Moon, Reddick and Dias, and Gomes are based on case studies in municipalities. Notably, Coursey and Norris and Norris and Reddick found that stage models could not be statistically proven in their empirical studies of eGovernment developments in US municipalities from 2000 to 2011 [48, 83].

Assessing which model is the most cited and influential remains difficult, since the original source of national, international, and consultant models is not always publically available, often not cited or referenced appropriately in the literature, and neither included in scientific databases nor available on sites such as ResearchGate and Google Scholar. Using Google Scholar (accessed 17 April 2015), the most frequently cited models are Layne and Lee's 2001 model [29] with 1,743 citations, Moon's 2002 model [44] with 1,377, Hiller and Belanger's 2001 model [64] with 952, West's 2004 model [43] with 870, and Andersen and Henriksen's 2006 model [27] with 403.

4.2. Maturity levels in stage models

From the 34 models, 11 different stages are identified from preconditions to transformation (or morphing) to eDemocracy. Table 4 overviews and maps the models and their respective stages. Model complexity varies; simple ones include Reddick's [74] two-stage model for presenting information online and transactional eServices and the World Bank's [60] three-stage model that adds user engagement to Reddick's. More complex models include Dias and Gomes's three-dimensional, 12-stage model [70] and the UN model of four stages and more than 200 indicators in its eGovernment Readiness Index [1].

Two clusters of development can be identified in the literature (table 4), the first during 1999–2003 consisting of 17 models: three models published by national authorities, three by international organisations, and four by consultancy models. All models include stages for the publication of static information online, transactional services (i.e., eServices), aspects of back-office integration, and a degree of public sector reform. Only the UN and EU models address preconditions such as the availability of Internet access, digital literacy, and Internet use.

Only Gartner's, Silcock's, and Accenture's models included ICT-enabled transformation (or morphing) of PAs. By contrast, Hiller and Belanger's, Wescott's, Moon and Netchaeva's address user engagement, participation, and decision making (i.e., eParticipation and eDemocracy) to some degree.

A second cluster from 2004 but for a longer period and consisting of 17 models shows three trends. First, all models build on ideas from the 1999–2003 cluster and include the presentation of static information online, eServices transactions, back-office integration, and a degree of ICT-enabled public sector reform. Second, such reform becomes more prominent and is included in 10 models compared to only three in the previous cluster. Third, eParticipation and eDemocracy are also included in more models. Added to these 10 models, compared to four in the previous cluster, that address user engagement and decision making, the period also encompasses the UN and EU's extension of their models to address those aspects [1, 2].

Results show that most of the 34 models use different semantics and metaphors for similar concepts. Similarly, many models and individual stages overlap, while commonalities exist among national, international, and consultancy models. Thus, the 11 overarching stages identified represent six specific metastage characteristics. Since Lee's framework does not include an initial precondition stage, it is added for the purposes of this article, thereby bringing the number of stages to six. Otherwise, the analysis supports Lee's 2010 findings, albeit based on a sample three times larger [47, 75].

5. Review of current stage models

The stage and metacharacteristic mapping in table 4 highlight several interesting aspects. Preconditions are addressed by three of 34 models, presenting and assimiliation by 32, reforming by 31, morphing by 13, and eGovernance by 16. Chief differences relate to the ICT-enabled morphing (i.e., transformation) of PAs and eParticipation and eDemocracy (i.e., user engagement and decision making).

5.1. Preconditions

Models such as the UN's [1], EU's [2], and Waseda's [75] that include preconditions focus on the availability of key enabling factors such as digital literacy, Internet availability and use, electronic identifiers (eID), the availability of a basket of electronic services, and access to public sector information, downloadable forms, and transactional eServices in aggregated terms. The aim is to enrich analysis and monitor the availability of key enablers. Unfortunately, none of the models address the actual use of enablers such as eIDs key to the increased personalisation of eServices and proactive service delivery based on user segmentation and unlocking back-office data, among others.

While Lee's framework includes management and governance issues in the final maturity level [54], in line with literature on IT governance [12], OECD recommendations [4], and Brown [10], governance structures and processes are arguably preconditions for successful ICT implementation and takeup. Factors not addressed includes whether the eGovernment strategy is legally binding for one or all levels of government, what mechanisms govern decision making, legal changes, coordination processes,and benefit realisation. Though CMMI models include these factors [16], Waseda's is the only eGovernment stage model to address governance, cooperation, promotion structures, and management optimisation directly [54, 75].

5.2. Presenting online information and services

Emerging from a national context, the Australian ANAO and SAFAD models [57] were introduced to categorise and evaluate processes to guide government organisations in their decisions about what services can and should provide. Layne and Lee's [29] 2001 model streamlines the development stages for online information and transactional services by merging different aspects into two categories: static information and downloadable forms on websites, as well as transactional aspects such as online service and forms.

Dias and Gomes's model [70] adjusts Layne and Lee's [29] and the EU benchmarking models [2] in their 2014 evaluation of local eGovernment maturity in Portugal. The proposed model consists of three parallel dimensions, each consisting of four stages: information (generic information, downloadable forms, search functionality, search parameterisation), service (information, user authentication, eService transaction, authentication and eService transaction), and participation (features, authentication and features, participative process, advanced participatory process).

Criticising Layne and Lee's model [29] for being too linear and too "US-centric", Heeks' Manchester eGovernment maturity model differentiates the front from back office [58]. The result is two parallel dimensions that form a matrix possibly inspired by CMMI; one focuses on the sophistication of digitised interaction (i.e., one- and two-way interaction plus transaction) and the other on the extent of process change (i.e., simple digitisation and automation, improvement process integration, redesign/reform, and transformation).

Though the presentation and publication of information and eServices have evolved over time, none of the models includes actual use. This result is in sharp contrast to research on PA reform and whether it is an NPM efficiency or JUG effectiveness approach [8, 9, 21, 52]. This trend is unfortunate, since the value added to a project comes from its use, not its existence.

5.3. Vertical and horizontal integration

Layne and Lee's stage model breaks from predecessors by including vertical and horizontal integration (i.e., Lee's reforming) as two distinct advanced levels of maturity [29]. Both Deloitte [62] and Gartner [72] mirror this development. In 2005, Persson and Goldkuhl [57] evaluated several models and proposed a two-stage model with a clear IS perspective. Based on Layne and Lee's [29], it focuses on the integration of services (i.e., services, directed and concentrated services, and portals), including the horizontal and vertical integration of organisations, processes, and the exchange and reuse of data.

5.4. ICT-enabled reform and transformation

As tables 2 and 4 show, the review identified 31 models that include ICT-enabled reform of PA as a maturity level (i.e., Lee's reforming and morphing). Of these models, 12 do not address ICT-enabled transformation (or morphing) and only 13 models view ICT as an enabler of PA transformation.

Of particular interest is Klievink and Janssen's [84] five-stage model: The levels of customer orientation and flexibility increase with each stage. Including stovepipes, integrated organisations, nationwide portals, interorganisational integration, and customer-driven, joined-up government, this model clearly reflects the JUG- (i.e., integration) and outcomes-based thinking in PA and eGovernment literature.

Kim and Grant [81] propose continuous improvement as a fifth maturity level featuring political activities and focusing on continuous improvements and performance. They regard ICT as an enabler of public sector innovation and reform, a logic also seen in the development of IT solutions. Lee and Kwak [82] take a similar approach in their data-based model for collaboration and ubiquitous engagement. Though data and collaboration form the core of their model, the development stages follow a classical stage model pattern from publication to transformation.

Considering the level of academic consensus on ICT as an enabler of PA reform and transformation, it is surprising how little attention is paid to actual outputs and results. Though cooperation is indirectly addressed by all models including reform and transformation, none look at governance's role in ensuring back-office integration, management, risk mitigation, or outcomes needed to move from one stage to another, a critique also voiced by Irani et al. DeBri and Bannister, and Bannister and Connolly [46, 47, 85].

5.5. Participative and democratic dimensions

The models of Hiller and Bélanger [64], Deloitte [62], and the World Bank [60] regarding legislative consultations were the first to add dimensions of engagement and cocreation (i.e., indirectly by non-governmental stakeholders) and aspects of democratic participation (i.e., Lee's eGovernance). The focus of these models remains on supply-side, technological, and organisational integration.

By contrast, active engagement, participation, and democratic decision making are aspects of the most advanced maturity levels proposed by authors such as Moon [44] and Siau and Long [77], while Chan et al. [76] add non-governmental stakeholders to their five-stage model focusing on supply-side, technological, and organisational integration. Similarly, the UN eParticipation index was introduced in 2012 [1], and EU benchmark introduced this aspect in 2013 [2].

Lee and Kwak's [82] five-stage model focuses on engagement and data exchange among authorities (i.e., horizontal and vertical integration), on transparency by increasing access to data, user engagement, and participation in decision making (i.e., eParticipation and eDemocracy), and on a total transformation of how PA delivers services and makes decisions (i.e., ubiquitous engagement). While increased transparency in government, political, and democratic processes are laudable, the latter two do not necessarily constitute a maturity level, especially when focusing on ICT use to improve the efficiency, effectiveness, quality, and added value of public sector service delivery [25]. It may also include an element of wishful thinking on the behalf of authors, as suggested by Norris and Reddick and DeBri and Bannister [46, 48]

5.6. Integration, user-centricity, and outcomes

While stage models, indexes, and benchmarks aid in mapping the supply and sophistication of eService offerings, they all have a technological focus. The relevance of these different models is limited in terms of governance, cooperation, measuring the successful use of online offerings, and thus added value.

Unlike other stage models, Andersen and Henriksen's [27] follow an activity- and user-centric approach to the personalisation of online services in their PPR model. It extends Layne and Lee's [29] by

making an online presence and horizontal and vertical integration its foundation [25, 61]. Meanwhile, Klievink and Janssen's model addresses outcomes yet stems from JUG research strand [45]. The approach is interesting as it reflects ideas of whole-of-government approaches [18, 20, 42], JUG [8, 22], and the personalisation of online service delivery [51, 86].

The importance of outcomes is a key topic in literature on PA reform [8, 21, 22, 26], IT governance [12], and eGovernment [9, 20, 31]. Several models are complimented with various benchmarks, indexes, and rankings [1, 2, 43, 63, 75], but several researchers have questioned their value due to their simplicity and focus on supply and technology [24-26, 46, 48, 52, 59, 87].

Andersen and Henriksen were the first researchers to take an outcomes-based approach, though their PPR model excludes qualitative and quantitative indicators of takeup. Waseda's [75] model differs somewhat from other stage models by not defining distinct levels of maturity. Though it includes both qualitative and quantitative indicators, including network preparedness and infrastructure, management optimisation, and efficiency, it does not directly address the actual use of eServices, but instead addresses preconditions such as Internet and mobile subscriptions.

6. Conclusion

The review of 34 stage models' stages and metacharateristics reveals several weaknesses.

First, all models, with the exception of the PPR [27] and Klievink and Janssen's [45] models, are technology and supply oriented without any focus on outcomes or use [54, 61]. However, the tangible benefits of any ICT solution and eServices in particularly can be realised only through the actual and effective use of supplied eServices [1, 46, 88, 89].

Second, most models show no real understanding of core government service concepts. For instance, individual service elements (e.g., information, transaction capability, and personal data) are not separate maturity levels but elements in a given service request and subsequent delivery. Similarly, downloadable forms are merely a type of static information and do not warrant a separate level [25]. This finding is particularly surprising, given that roughly half (i.e., 18 of 34) the models are partially based on observations, experiences, and case studies in at least one country (table 3).

Third, decision making, exemplified by the eParticipation and eDemocracy stages, should not be considered an eGovernment maturity level. Dias and Gomes [70] make this argument indirectly in defining engagement, petition, and voting solutions as types of public services—that is, those consisting of information, transaction capability, some form of data (e.g., election data), Internet voting solutions allowing for vote casting, and data such as unique ID numbers, names, and addresses for authorising votes. Thus, the eParticipation and eDemocracy stage(s) should be seen as indications of democratic maturity and transparency, but not as eGovernment maturity levels [50, 70].

Fourth, front-office service provision and back-office integration are mixed in many models. For instance, one-stop shop portals do not constitute a form of transaction, but indicate the degree to which authorities cooperate and strive for integration in providing services via portals [25]. Heeks attempts to address this problem with a two-dimensional matrix model that distinguishes the front from back office [58], yet does not account for governance or takeup.

Fifth, no identified model addresses governance directly. Some, including Waseda's, highlight management and coordination issues such as the existence of chief information officers [75]. Cooperation, however, is indirectly addressed in most models, manifested in terms of vertical and horizontal integration, the existence of one-stop shops, and information sharing among authorities and governmental levels, even private and third-party stakeholders [82, 90].

Sixth, as table 4 illustrates, most models merely restructure or adjust existing ones. Key exceptions are Andersen and Hendriksen's PPR model [27] and Waseda's [75], which build on existing models while seeking to address outcomes and governance issues.

7. Future research

The weaknesses can be summarised in two research questions, which the author will attempt to answer in future research. First, does a strong governance model and high level of intergovernmental action lead to the successful supply and use of online citizen services? Second, can success factors be mapped and developed into a governance model for successfully digitising public sector service delivery and eService takeup?

To answer these questions, the author will conduct a multicountry qualitative case study including existing governance models, level of intergovernmental cooperation, and strategic focus for a set period (e.g., 2010–2015). Several quantiative effect measurements on digital literacy, availability, and the use of eIDs and a basket of eServices can provide an empirical basis for the effect of a given governance model. The case study findings will guide an attempt to address governance and the use of eServices in eGovernment stage model discourse. It is expected that this will involve a further analysis of CMMI models not covered in this literature review.

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Article V

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Research Gaps on Public Service Delivery

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ABSTRACT
This paper follows the research framework for context-specific public service delivery presented at ICEGOV 2016 [1]. The research has been conducted at the UNU-EGOV unit during the last year. The paper presents the research landscape for ICT enabled public service delivery scientific and policy literature. The findings are analyzed and presented in a conceptual framework allowing us to identify the core dimensions and sub-dimensions of public service delivery.

The paper concludes by outlining the research gaps identified by the study and a series of policy recommendations to enhance public service delivery. The results showed that the Innovation and Evaluation dimensions and their sub-dimensions, Innovating Public Procurement, Collective Learning and Intelligent, Evidence-Based Policy Making and Social Media Impact are the areas with less investigation.

CCS Concepts
• **Applied computing~E-government**

Keywords
Policy-Driven Electronic Governance; Context-specific Public Service Delivery; Dimensions; Research Gaps; Recommendations; Public Service

1. INTRODUCTION
Public Service Delivery (PSD) is challenged by diverse social needs, ageing societies, economic pressure, income inequality, and unequal access to services. For example, the failure of PSD in many developing countries is not just due to the scarcity of resources but to the problems of incentives, accountability and governance that vary from one context to another [2]. Similarly, the quality of PSD may differ from one context to another, resulting in universal public service provision intended to reduce inequality achieving the exact opposite.

Under the title Electronic Governance for Context-Specific Public Service Delivery, UNU-EGOV is currently conducting research on how digital innovation, ICT facilitated PSD systems can be used in different national, local and sectoral contexts. The aim is to identify the critical factors affecting the performance of PSD systems and how such factors operate in different cultural and contextual settings, and examine how ICT and digital innovation could be used to transform such systems and enhance their performance vis-à-vis PSD [3] and the UN Strategic Development Goals (SDGs) [4].

As part of the ongoing work at UNU-EGOV this paper presents the results of a classical literature review of the current landscape of ICT facilitated PSD. The paper is structured as follows. Section 2 outlines the key aspects of public sector service delivery. Section 3 presents the research methodology. Section 4 shows the research landscape of public service delivery in terms of disciplines, institutions, countries, types of publications and venues of publications. Section 5 analyzes three international and one national public service delivery policy frameworks and based on that analysis extracts the dimensions and sub-dimensions of public service delivery. Section 6 presents the research literature review on ICT and public service delivery in light of the dimensions and sub-dimensions identified in previous section, i.e. the list of the selected papers on the subject have been classified under the dimensions and sub-dimensions.

Finally, Section 7 presents the main findings of this study in terms of research landscape, policy and literature review and research gaps, and concludes the paper by making some recommendations on public service delivery grounded in the outcomes of this study.

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2. BACKGROUND
Public services as a term is difficult to define because it depends on the context and tradition of a given country and organization. For instance, the Anglo-Saxon perception of public service differs from a Weberian continental perception.

In the Anglo-Saxon model, a capitalist model, the public managers try to mimic private sector best practices, which are mainly oriented to the profit, and the public sector should provide fewer services [5]. The Weberian approach, a bureaucratic model, the public

organizations has a hierarchical structure and are governed by rational-legal decision-making rules [6].

The Merriam-Webster Dictionary defines public service as "*the business of supplying something (such as electricity, gas, or transportation) to the members of a community; something that is done to help people rather than to make a profit; work that someone does as part of a government: the work done by public servants*" [7].

Typically, public services include the following areas of public management: 1) central and local government; 2) health, education, defense, judicial system, internal affairs and 3) noncommercial semi-state organizations [8]. In this regard, public service may be defined as "*services which are mainly, or completely, funded by taxation*" ([8], p. 6 - For discussion see [8] pp. 6-9). Others differentiate between "*core government services",* i.e. activities that one must do as a citizen (e.g. pay taxes, apply for pensions or permits) and "*public value adding services"* i.e. what one would like to do as an individual (e.g. find the nearest playground, transportation directions, participate in decision making).

Public service composition also has several definitions. The OECD [9] defines it in terms of what information (right data) needs to be provided by a citizen or business and when (right time) and how (design) it needs to be provided in the public service request and delivery process. Others argue that all public services can be separate in "*information based services*", i.e. getting an answer to a question (e.g. how, when, how much does one receive from a service) and "*transactional services*" i.e. applying for something (e.g. a permission, a subsidy, a license).

A public service therefore consists of one or more of the following elements: 1) *Informational Data* (i.e. relevant information and content); 2) *Personal Data* (i.e. personal data such as identity, geographical location, income, etc.) and/or 3) *Transactional Data* (i.e. finding or applying for something) required by an authority to deliver the correct answer to a question or process an application (adapted from [10]). As illustrated in Figure 1, this means that personalized services must combine one or more relevant elements i.e. information, transaction capability, and data.

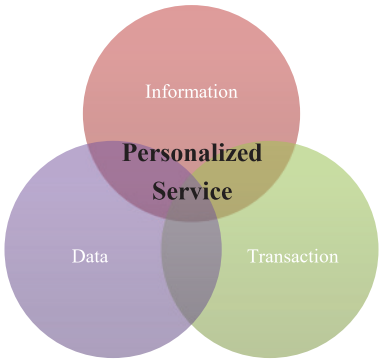

Figure 1: Personalized Service (Adapted from [10]**)**

When examining public services, it is essential to look at the delivery channel. Service delivery channels cover various contact and interaction points through which a public service can be requested by a citizen or company. Four general delivery channels exist: 1) the physical *in person* channel (e.g. one-stop-service centers); 2) the written requests (i.e. traditional paper mail, paper forms and increasingly e-mails); 3) the voice (e.g. telephone or video conferencing); and 4) the online self-service (e.g. websites, e-Services, apps requiring an internet connection).

Channel strategies, is in turn defined as the delivery strategy applied to a given service area. The objective of any organization's channel strategy is to direct users to the most appropriate and most cost efficient channel for a given service. Analysis by Local Government Denmark (the national association of municipalities) highlight that online self-service is between 2 and 3.75 percent cheaper than other public service delivery channels in Denmark [11]. While the numerical costs of service delivery vary across channels, service types, organizations, and countries, the strengths, weaknesses and real expenses of the four channels in relation to one another are confirmed by practitioners to largely hold in a European context, as well as in Austria, Finland, Georgia, the Netherlands, Oman, Japan, Singapore and Sweden [10].

In order to have a better understanding of public service delivery, the public service concept, areas of public management, personalized services and channel strategies have been revised in this section. The next section presents the methodology used to conduct this research work.

3. METHODOLOGY

As showed in Figure 2, the adopted methodology for searching literature included two steps: 1) Identifying Relevant Policies and 2) Identifying Relevant Research.

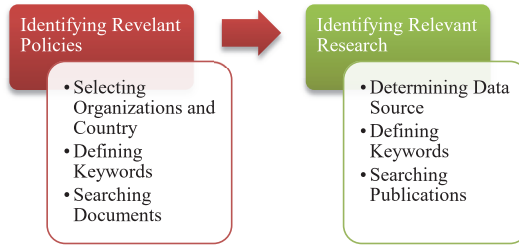

Figure 2: Searching Methodology

The policy review process started with the selection of policy documents on public service delivery from international organizations and another from a target country - Ireland because it is well-documented and actual - for comparative reasons.

In contrast, the research review was carried out as a classical literature review [12][13], starting with a search on the two most relevant scholarly databases. Scopus [14] and Web of Science [15] were chosen as they are both leading sources of scholarly research data, and provide a reliable, integrated and multidisciplinary source of research. The identification of scientific databases was followed by the definition of the keywords to be used in the search for publications. The key words ("Public Service Delivery" AND "Information and Communication Technology") were applied to both scientific databases, Scopus and Web of Science, which returned 286 and 127 publications, respectively.

The data collection process comprised three main phases: 1) determining the data sources to search relevant literature, 2) defining the appropriate keywords to collect the most relevant

publications, and 3) doing the search for publications on the selected data source with the defined key words.

Figure 3 shows the number of publications per year since 1999 until 2015 from the search on Web of Science database. Figure 4 shows the result of the same search in the same period on Scopus.

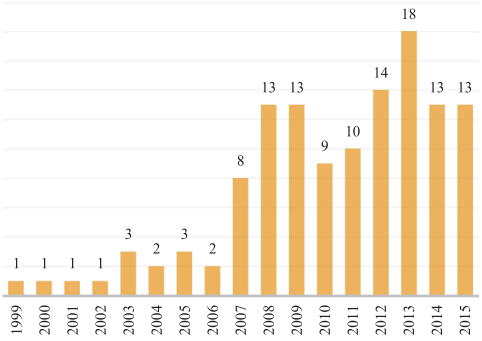

Figure 3: Search on Web of Science

As it can be seen in Figure 3 and Figure 4 both graphs show a similar curve trend in terms of growth of publications, but with a vastly different number of publications returned. The key word search in Scopus returned 286 publications, twice the number of Web of Science's 127 publications. As a result, the output of the two key word searches was screened in terms of relevance. Scopus was subsequently selected as the main data source due to its broad coverage on public service delivery and ICT investigation.

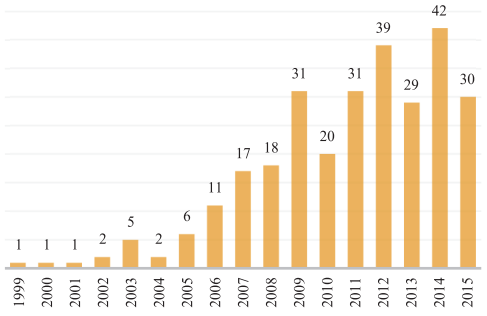

Figure 4: Search on Scopus

Figure 4 shows that the growth of Public Service Delivery research started in 1999 when the first paper on the topic was published. From 1999 until 2006, the popularity and growth rate of the research area remained relatively low, with only 29 papers published during this eight-year period. However, in the following years, the publication rate increased considerably with 97 publications between 2006 and 2010 and a yearly average above 34 between 2011 and 2015. When the last eight years (240 publications) are compared with first eight years (18 publications), the number of publications increased more than tenfold.

The chosen keyword search was applied to Scopus on April 12, 2016 against article titles, abstracts and author defined keywords. The Scopus search produced 286 publications. A brief extract of the bibliographic information of the publications obtained in Scopus is shown in Table 1.

NO	YEAR	AUTHORS	TITLE
1	2016	Höchtl J., Parycek P., Schöllhammer R.	Big data in the policy cycle: Policy decision making in the digital era [16]
2	2015	Lucas H.	New technology and illness self-management: Potential relevance for resource-poor populations in Asia [17]
3	2015	Sundar D.K., Garg S., Garg I.	Public health in India: Technology, governance and service delivery [18]
4	2015	Islam M.M., Ehsan M.	E-governance as a paradigm shift in public administration: Theories, applications, and management [19]
5	2015	Masrom M., Ai Ling E.L., Din S.	E-participation behavioral in e-government in Malaysia [20]
6	2015	Islam M.M., Ehsan M.	Understanding e-governance: A theoretical approach [21]
…	…	…	…
285	1978	Cramp D.G., Carson E.R.	A model-based framework for public health: A vehicle for maximising the value of telecare? [22]
286	1975	Pratchett L.	New technologies and the modernization of local government: An analysis of biases and constraints [23]

Table 1: Results of the Search on Scopus

After collecting and selecting the relevant literature on the topic, as showed in Figure 5 the remaining research methodology used to conduct this study was: 1) drawing the research landscape (Section 4); 2) making the research literature analysis (Section 5); 3) making the research literature analysis (Section 6) and 4) describing the findings and writing the conclusions (Section 7).

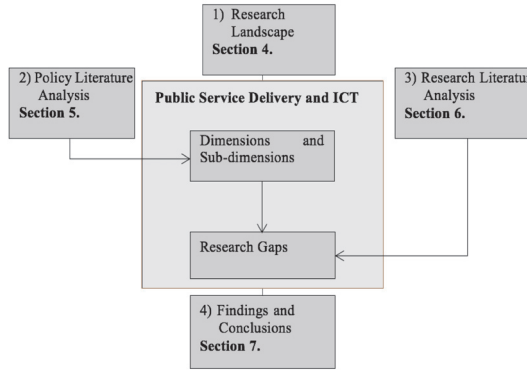

Figure 5: Research Methodology

4. RESEARCH LANDSCAPE

The 286 papers obtained from the data collection in Scopus have been analyzed quantitatively to produce an overview of the research landscape on ICT facilitated Public Service Delivery. The analysis was focused on five research aspects, each one covered by subsequent sections:

1) Researcher Disciplines – Sub-Section 4.1
2) Researcher Institutions – Sub-Section 4.2

3) Researcher Countries – Sub-Section 4.3
4) Types of Publications – Sub-Section 4.4
5) Venues of Publications – Sub-Section 4.5

4.1 Researcher Disciplines

Based on the discipline affiliation of the authors, the list of contributing disciplines and the percentages of researchers belonging to them are depicted in Figure 6 and Table 2.

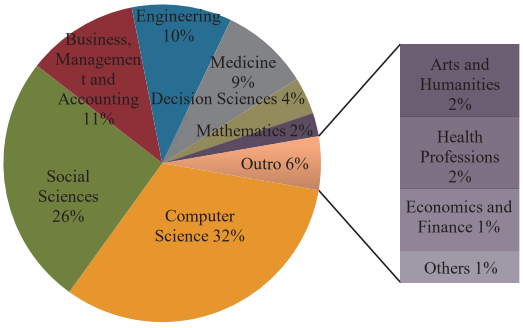

Figure 6. Research Landscape – Researcher Disciplines

The area is dominated by Computer Science (32%) denoting that Electronic Public Service Delivery strongly relies on technologies. The strong technological research focus is closely followed by Social Sciences (26%) highlighting the importance of the social dimensions of Public Service Delivery. Other research disciplines include Business, Management and Accounting (11%), Engineering (10%), Medicine (9%), Decision Sciences (4%), Mathematics (2%), Arts and Humanities (2%), Health Professions (2%), Economics, Econometrics and Finance (1%) and Other Areas (1%).

The high number of disciplines with an interest in Public Service Delivery research shows its multi-disciplinary nature, but also highlights the complexity of the scientific domain and the need to address cross-cutting problems in different areas.

NO	DISCIPLINE	RESEARCHERS	PERCENTAGE
1	Computer Science	136	32%
2	Social Sciences	108	26%
3	Business, Management and Accounting	48	11%
4	Engineering	43	10%
5	Medicine	38	9%
6	Decision Sciences	16	4%
7	Mathematics	10	2%
8	Arts and Humanities	7	2%
9	Health Professions	7	2%
10	Economics and Finance	6	1%
11	Others Areas	3	1%

Table 2. Research Landscape – Researcher Disciplines

Table 2 lists the disciplines contributing to the research on Public Service Delivery and the percentages of researchers in each discipline, and Figure 6 illustrates the same in a pie chart.

4.2 Aspect 2 – Researcher Institutions

The leading research institutions are depicted in Figure 7 and listed in Table 3.

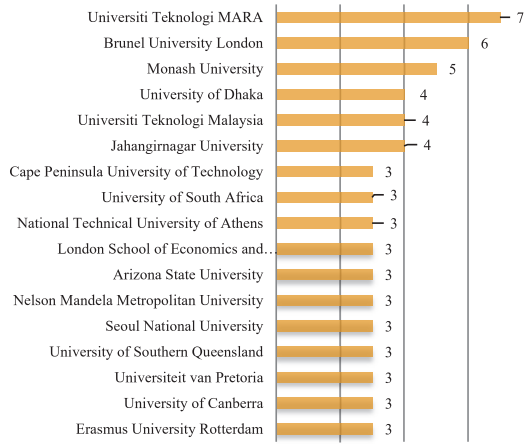

Figure 7. Research Landscape – Researcher Institutions

Based on researcher affiliations, the most productive research institutions on Public Service Delivery include: 1) Universiti Teknologi MARA, Malaysia, with 7 publications; 2) Brunel University London, United Kingdom, with 6 publications; 3) Monash University, Australia with 5 publications; 4) University of Dhaka, Bangladesh, Universiti Teknologi Malaysia, Malaysia, and Jahangirnagar University, Bangladesh, with 4 publications each. In position five (5) is Cape Peninsula University of Technology, South Africa, University of South Africa, South Africa, National Technical University of Athens, Greece, London School of Economics and Political Science, United Kingdom, Arizona State University, United States, Nelson Mandela Metropolitan University, South Africa, Seoul National University, South Korea, University of Southern Queensland, United States, Universiteit van Pretoria, South Africa, University of Canberra, Australia, and Erasmus University Rotterdam, Netherlands, each with 3 publications.

Clearly, United Kingdom and Southern Asian countries dominate the field.

NO	INSTITUTION	COUNTRY	PAPERS
1	Universiti Teknologi MARA	Malaysia	7
2	Brunel University London	United Kingdom	6
3	Monash University	Australia	5
4	University of Dhaka	Bangladesh	4
5	Universiti Teknologi Malaysia	Malaysia	4
6	Jahangirnagar University	Bangladesh	4
7	Cape Peninsula University of Technology	South Africa	3
8	University of South Africa	South Africa	3
9	National Technical University of Athens	Greece	3
10	London School of Econ. and Political Science	United Kingdom	3
11	Arizona State University	United States	3
12	Nelson Mandela Metropolitan University	South Africa	3
13	Seoul National University	South Korea	3
14	University of Southern Queensland	Australia	3
15	Universiteit van Pretoria	South Africa	3
16	University of Canberra	Australia	3
17	Erasmus University Rotterdam	Netherlands	3

Table 3. Research Landscape – Researcher Institutions

4.3 Aspect 3 – Researcher Countries

Based on researcher and institutional affiliations, the leading countries in producing Public Service Delivery research are: United

Kingdom, India, United States of America (USA), South Africa, Malaysia, Italy, Australia, Bangladesh, and Canada. The results, including the number of publications produced per country, are depicted in Figure 8. (please note that one publication just count once even if it is more than author with the same nationality). This should naturally be taken with a caveat as our literature search only covers research published in English.

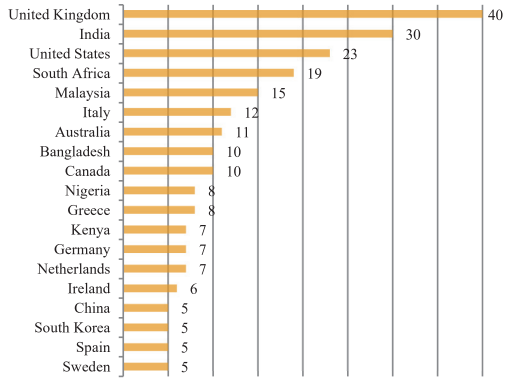

Figure 8. Research Landscape – Researcher Countries

The results show that the United Kingdom has the highest number of publications with 27% more than the second country in the list, United States. Regionally, the majority of the leading countries United Kingdom (172), Spain (88), Germany (78), Netherlands (52), Italy (46), Finland (43), Belgium (41), and Greece (30) are located in Europe, with the exception of the USA (125) which is in the Americas and Australia (43).

4.4 Aspect 4 – Types of Publications

As depicted in Figure 9, the majority of the scientific work on Public Service Delivery was produced as Conference Papers – 126 (44%), followed by Journal Articles – 89 (31%). Other types 39 (13%) Book Chapters, 17 (6%) Conference Reviews, 8 (1%) Reviews, 5 (1%) Books and 2 (1%) Articles in Press.

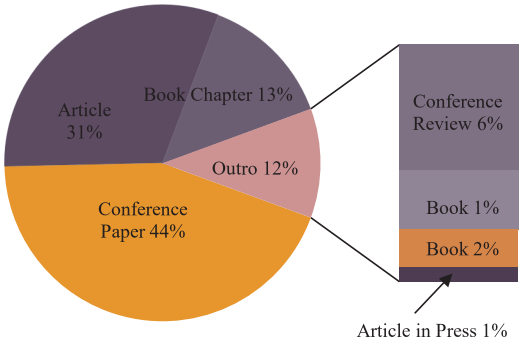

Figure 9. Research Landscape – Types of Publications

4.5 Aspect 5 – Venues of Publications

Considering the types of publications, preferred venues to publish such publications include, by order of popularity: "Government Information Quarterly" by Elsevier Limited, "IFIP Advances in Information and Communication Technology" by Springer New York, "Innovation and the Public Sector" by IOS Press, "International Journal of Medical Informatics" by Elsevier Ireland Ltd, and "Public Administration" by Wiley-Blackwell. Figure 10 depicts the venues with three or more publications, and Table 4 lists all venues with two or more publications.

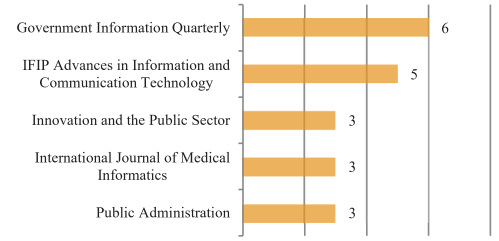

Figure 10. Research Landscape – Venues of Publications

NO	VENUE	TYPE	PAPERS
1	Government Information Quarterly	Journal	6
2	IFIP Advances in Information and Communication Technology	Journal	5
3	Innovation and the Public Sector	Journal	3
4	International Journal of Medical Informatics	Journal	3
5	Public Administration	Journal	3
6	European Journal of Social Sciences	Journal	2
7	BMC Medical Informatics and Decision Making	Journal	2
8	International Journal of Healthcare Technology and Management	Conference	2
9	Lecture Notes of the Institute for Computer Sciences Social Informatics and Telecommunications Engineering	Journal	2
10	Information Polity	Journal	2
11	International Journal of Construction Education and Research	Journal	2
12	Regional Development Dialogue	Journal	2
13	Social Science Computer Review	Journal	2
14	Social Science and Medicine	Journal	2
15	Transforming Government People Process and Policy	Journal	2

Table 4: Research Landscape – Venues of Publications

5. POLICY LITERATURE ANALYSIS

In this section three frameworks for public service delivery developed by international organizations and one national administration are reviewed and analyzed. The national framework for public service delivery is from Ireland and was chosen because it is one of the earliest and a well-documented example. The Irish example has therefore been included for illustrative purposes. The four frameworks are:

1) United Nations e-Government Survey 2014 - United Nations Department of Economic and Social Affairs (UNDESA), United Nations [24];
2) Innovative Public Service Delivery: Learning from Best Practices – UNDESA, United Nations [25];
3) Rebooting Public Service Delivery: How Can Open Government Data Help to Drive Innovation - Organisation for Economic Co-operation and Development (OECD) [9], and;
4) Improving Service Delivery – Ireland Government [8].

Each of the four frameworks has been analyzed in terms of their focus, vision, strategic dimensions, and characteristics. After the policy documents were analyzed, their features and attributes have been organized and classified into four main dimensions, which include:

1) Strategy;
2) Capacity;
3) Innovation, and;
4) Evaluation.

Table 5 highlights the key recommendations made by the frameworks for each of these public service dimensions. Regarding the strategy dimension the frameworks' recommendations point out to the importance of having a policy context and strategic framework for public service delivery and to promote the integration of services between public organizations.

DIMEN.	UNDESA	UNDESA	OECD	IRELAND
Strategy	Connected Services	Policy and strategic framework for public service delivery	The policy context for OGD implementation	Improve the integration of services between public service organizations
Capacity	Use of e-Government	Governance, structure and capabilities for public services	Building the next generation of empowered civil servants	Innovative approaches to public involvement in development of the services
Innovation	e-Participation and mobile government	Collaboration and innovation for public services	Stimulating engagement and participation to spur innovation	Innovative approaches to public involvement in development of the services
Evaluation	Service usage	Reorientation and cultural change on public services requires to focus on meeting customer needs	Monitoring & Evaluation	Using predictive data analytics to spot trends and societal needs Linking open government data with evidence-based policy making

Table 5 : UNDESA, OECD and Ireland Policy Recommendations

The capacity dimension stresses the importance of the use of ICT in government, development of governance structures and capabilities for public services, and the empowerment of civil servants. The innovation dimension promotes the engagement and participation, it highlights the importance of stimulating the engagement and participation of the intended end-user (i.e. citizens or businesses) in the development of new services, for instance using mobile apps and the collaboration and innovation in the public services. The last dimension, evaluation, emphasizes the importance of measuring the impact of public service delivery on society, analyzing the data to investigate the trends and societal needs and evaluating the service use.

Figure 11 illustrates the conceptual map and the most relevant dimensions of public service delivery identified in the analyses of the four frameworks. It shows the four dimensions of public service delivery emphasized by the policy review. The four dimensions include: "Strategy", "Capacity", "Innovation, and "Evaluation".

Figure 11: Public Services Delivery Dimensions

5.1 Strategy Dimension

The Strategy dimension is composed by the policy and strategy that provides the overall direction, priorities and guidelines for public service delivery and by the programme formulation which operationalizes the overall policy and strategy.

At the policy level, the political will to provide incentives, funding and other resources to ensure policy coherence, collaboration and social inclusion, as well as a legal and regulatory framework for a good service provision, is a key goal to ensure that public service policies and strategies contribute collectively to national development goals, and improved quality of life for citizens. At the strategy level, three strategies are particularly important. First, poverty eradication, second, gender equality in public services, and third, of the use of risk management strategies to cover disasters [26][27][28][29]. At the planning level, implementation measures need to be defined in order to achieve and operationalize the policy goals.

Figure 12 below shows a conceptual map with the Strategy dimension. It outlines eight key aspects for the Government dimension covered and highlighted in the reviewed policy documents. Noticed that these eight aspects are not covered in all policy documents, some of them only cover part of the aspects. The eight aspects include: 1) Policy, strategy and planning; 2) Infrastructure development; 3) Resource mobilization and utilization; 4) Leadership and accountability; 5) Law, security and property; 6) Policy context; 7) Overcoming main challenges; and 8) Promotion of public service.

Figure 12: Strategy Dimension

5.2 Capacity Dimension

The Capacity dimension is concerned with institutional development in the public sector and civil servants' skills and capacity development and level of empowerment vis-a-vis initiatives and policies as well as decision making. Public service delivery requires a multi-dimensional approach, i.e., knowing the individual, organizational and institutional levels and how they interrelate and interact. In order to implement this approach a strong public leadership at all levels of government structures is required. The leaders are the agents of change and have a key role in building

organizational capacity. The development and empowerment of civil servants through suitable training, applications and processes are demanded to have an efficient, effective and operational public service delivery.

Figure 13 outlines the conceptual map of the main policy recommendations for the Capacity dimension. It shows the nine aspects constituting the Institutional dimension covered and highlighted by the reviewed frameworks and policy documents. The nine aspects include: 1) Enhanced information services; 2) Multichannel service delivery; 3) Bridging digital divide; 4) Integration of services; 5) Organizational reorientation; 6) Empowered civil servants; 7) Evolving public sector internal dynamics; 8) Public awareness and consulting; and 9) Providing services.

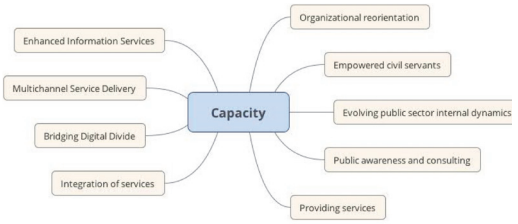

Figure 13: Capacity Dimension

5.3 Innovation Dimension

The Innovation dimension consists in promoting collective learning, collective intelligence, and social participation in service delivery and policy making. Civil society, the private sector and the public sector engage in order to introduce social innovations capable of addressing the societal challenges. In order to engage the various stakeholders in value creation, public entities must encourage individuals or groups to participate in public service delivery.

Figure 14 illustrates the seven sub-dimensions in a conceptual map of policy recommendations for the Innovation dimension. It shows the seven aspects of the Innovation dimension covered and highlighted in the reviewed policy documents. The seven aspects include: 1) Mobile Government; 2) Innovating ordinary citizens' experience; 3) Innovations in public procurement; 4) Collective learning and intelligence; 5) Innovation for public service; 6) Engagement and participation; and 7) Public involvement in the service development.

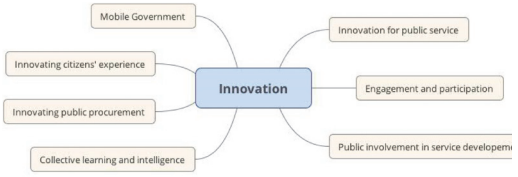

Figure 14: Innovation Dimension

5.4 Evaluation Dimension

The Evaluation dimension essentially focus on the monitoring and measuring of the impact of public service delivery, the design, development, implementation and actual use (e.g. on different channels). Above all, the Evaluation dimension focuses on the assessment of the cost to authorities in delivering, and the impact and benefits to society, of public service delivery. The public sector, as well as other public service providers, must collect relevant data and evidence to justify the decisions made regarding service delivery – not just in relation to financial costs and benefits, but qualitative, social and environmental impact. The evaluation of costs and benefits, and comparisons with other similar studies on the subject to learn from good practice, are advisable.

From the measurement it is possible to monitor and evaluate whether the costs out weight the benefits planned and realized benefits, and adjust accordingly when there are significant deviations. Using predictive data analytics also makes it possible to identify societal needs and trends. The public services must reflect the political, social, and cultural context, therefore measuring is crucial for evidence-based policy-making.

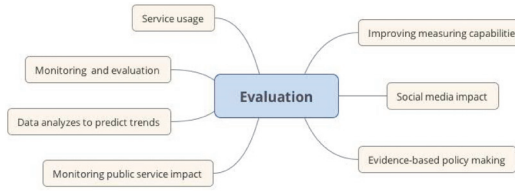

Figure 15: Evaluation Dimension

Figure 15 below illustrates the policy recommendations for the Evaluation Dimension as conceptual map. It shows the seven aspects about the Monitoring dimension covered and highlighted in the reviewed policy documents. The seven aspects include: 1) Service usage; 2) Monitoring and evaluation; 3) Data analyzes to predict trends; 4) Monitoring public service impact; 5) Improving measuring capabilities; 6) Social media impact; and 7) Evidence-based policy making.

6. RESEARCH LITERATURE ANALYSIS

This section presents the analysis of the content of 193 research papers that have been selected, as relevant for the project [3], from the initial pool of 286 papers. The number of relevant papers were narrowed down from 286 to 193 by the UNU-EGOV research team based on criteria of the publication relevance and importance for the project [30]. Some publications were also eliminated because were repeated or the full text was not available.

The analysis aimed at establishing if and how the selected papers address each of the four dimensions of the Public Service Delivery identified in the previously section, namely: Strategy, Capacity, Innovation, and Evaluation. The results are outlined in subsequent subsections:

1) Strategy Dimension – subsection 6.1.
2) Capacity Dimension – subsection 6.2.
3) Innovation Dimension – subsection 6.3.
4) Evaluation Dimension – subsection 6.4.

Figure 16 illustrates the number of publications in each of the PSD dimensions. It shows that the Evaluation Dimension has the smallest percentage with 11% (i.e. 28 publications), the Innovation has 60 of the publications (23%), Capacity has 80 of the publications (31%) and Strategy has the highest percentage with 35% i.e. 91 of the publications.

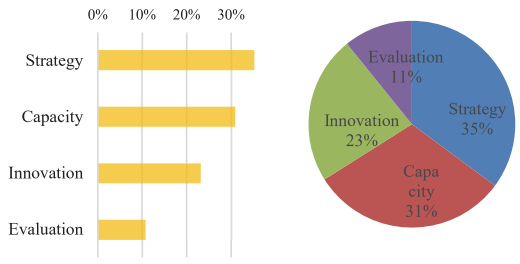

Figure 16: Percentage of Publications in Each Dimension

6.1 Strategy Dimension

In the previous section eight sub-dimensions have been identified as relevant in the Strategy dimension, namely: Policy, strategy and planning; Infrastructure development; Resource mobilization and utilization; Leadership and accountability; Law, security and property; Policy context; Overcoming main challenges to; and Promotion of public service.

Figure 17 illustrates the number of academic publications addressing one or more of each of these eight sub-dimensions of the Strategy dimension. The sub-dimension with the highest number of publications is the "Policy, strategy and planning" with 32, followed by "Overcoming main challenges" with 13, "Infrastructure development" with 12, "Policy" with 11, "Promotion of public service" with 10, "Leadership and accountability" with 9, "Law, security and property" with 6 and, with the lowest number of publications, "Resource Mobilization and Utilization" with 4.

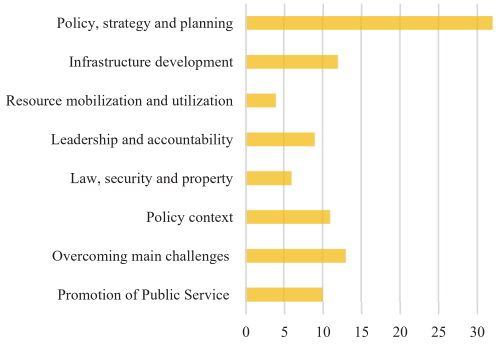

Figure 17: Number of Publications in Each Sub-dimension of Strategy Dimension

6.2 Capacity Dimension

In the previous section nine sub-dimensions have been identified for Capacity dimension, which were Enhanced information services, Multichannel service delivery, Bridging digital divide, Integration of services, Organizational reorientation, Empowered civil servants, Evolving public sector internal dynamics, Public awareness and consulting, and Providing services.

Figure 18 illustrates the number of publications in each sub-dimension of the Capacity dimension. The sub-dimension with highest number of publications is "Enhanced Information Services" with 18, followed by "Organizational Reorientation" with 11, "Providing Services" and "Integration of Services" with 8 each, "Evolving Public Internal Dynamics" with 6, "Empowered Civil Servants" with 5. The lowest is the "Public Awareness and Consulting" with 1.

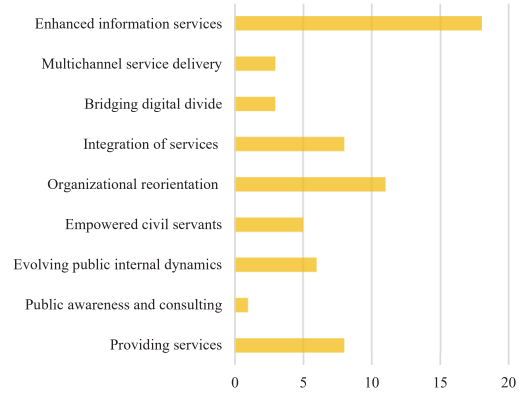

Figure 18: Number of Publications in Each Sub-dimension of Capacity Dimension

6.3 Innovation Dimension

In the previous section seven sub-dimensions have been identified for the Innovation dimension, which were Mobile government, Innovating citizens' experience, Innovating public procurement, Collective learning and intelligence, Innovation in public services, Engagement and participation, and Public involvement in service development.

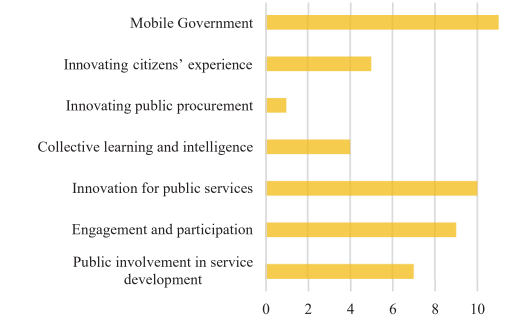

Figure 19: Number of Publications in Each Sub-dimension of Innovation Dimension

Figure 19 illustrates the number of publications in each sub-dimension of the Innovation dimension. The sub-dimension with the highest number of publications is "e-Participation and Mobile Government" with 11, closely followed by "Innovation in Public Services" with 10, then comes the "Engagement and Participation" with 9, after the "Public in Service Development" with 7 and "Innovating Citizens' Experience", "Collective Learning and Intelligence" and "Innovating Public Procurement" with 5, 4 and 1, respectively.

6.4 Evaluation Dimension

In the previous section seven aspects have been identified for Evaluation dimension, including Service usage, Monitoring and evaluation, Data analyzes to predict trends, Monitoring public

service impact, Improving measuring capabilities, Social media impact and Evidence-based policy making.

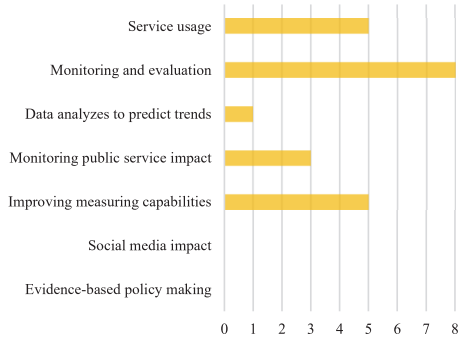

Figure 20: Number of Publications in Each Sub-dimension of Evaluation Dimension

Figure 20 illustrates the number of publications in each sub-dimension of the Evaluation dimension. The sub-dimension with highest number with publications is the "Monitoring and evaluation" with 8, then is the "Service Usage" and "Improving measuring capabilities" each one with 5, "Monitoring public service impact" with 3, "Data analyzes to predict trends" with 1 and the remaining sub-dimensions, "Social media impact" and Evidence-based policy making" with zero. It can be noticed that no publication was found for the last two sub-dimension.

7. FINDINGS AND CONCLUSIONS

The illustration of the various aspects of the research landscape demonstrates the multi-disciplinary nature of public service delivery with its high variety of disciplines – in fact, more than 11 contributing to the academic literature identified. That said, the computer and social sciences are the main contributors to the academic discourse, accounting for 32% and 26% of the identified literature, respectively. The maturity of digital innovation and ICT facilitated public service delivery seems to be relatively low, with most research being published as conference papers (44%). Based on this observation it is recommendable for more multi-disciplinary teams to research public service delivery.

In light of the four policy frameworks reviewed, the most important factors to consider to enhancing public service delivery are: Strategy, Capacity, Innovation and Evaluation. By comparison, the public service delivery academic literature reviewed highlights that most scientific research relates to Strategy (35%) and Capacity dimensions (31%) with less attention been given to the Innovation dimension (23%) and even less to the Evaluation dimension (11%). It is therefore recommended that future public service delivery initiatives and scientific research take into account the importance of transforming traditional public services delivery and providing innovative solutions capable of improving the quality, efficiency and user experience with service. The continuous evaluation from the idea and design to roll-out and realized outcomes is extremely important to achieve fundamental attributes in public services such as, transparency, accountability and awareness in public policy-making process.

By analyzing the research results on the sub-dimension of Strategy, it is noticeable the predominance of research in "Policy, strategy and planning" (33%), "Overcoming main challenges" (13%) and "Infrastructure development" (12%) but there is a big research gap on "Resource mobilization and utilization" (4%) and "Rule of law, justice, respect for human rights, law and order, security of person and property" (6%). Looking at the sub-dimensions of Capacity is evident a higher amount of research in "Enhanced services" (29%) and "Organizational reorientation" (17%) issues but a significant research gap in areas such as "Public awareness and consulting" (2%), "Multichannel service delivery" (5%) and "Bridging digital divide" (5%).

The analysis of the sub-dimensions of Innovation revealed a strong research in "e-Participation and mobile government" (23%) and "Innovation in public services" (21%) although, a lack of research on "Innovating public procurement" (2%) and "Collective learning and intelligence" (9%). Finally, in relation to Evaluation the two sub-dimensions more investigated by the scientific community are "Monitoring and evaluation" (36%) and "Service usage" (23%) whereas the areas of "Evidence-based policy making" (0%) and "Social media impact" (0%) do not showed in our study any attention by scholars.

Finally, it is recommendable to establish a unanimous and global research agenda on public service delivery, capable of join the efforts of all scientific community in turn of this so crucial subject for achieving a sustainable development around the world, as highly stressed out by the United Nations 2030 Sustainable Development (SD) Agenda [4].

In line with objectives and outcomes of the project, the next steps will be to develop a framework able to address the areas where research gaps were found, i.e. innovation and evaluation areas, as well as, to develop a toolkit and test it in different contexts (e.g. sectoral, cultural, governmental, etc.) and services areas through a number of pilot projects. The toolkit will be built based on framework and will serve to inform government policy and practice in developing countries. By utilizing this framework, it is expected to obtain digital innovations in Public Service Delivery. This framework will help governments in developing countries in carrying out structural improvements of their Public Administration systems using digital technology.

8. ACKNOWLEDGMENT

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Article VI

Meyerhoff Nielsen, M. (2016). Digitising a small island state: A lesson in Faroese. ICEGOV conference proceedings In: J. Bertot, E. Estevez and S. Mellouli, eds., *ICEGOV '15–16: Proceedings of the 9th International Conference on Theory and Practice of Electronic Governance*, vol. 9. New York: ACM, pp. 54–59. doi: 10.1145/2910019.2910042 (ETIS 3.1).

Digitising a Small Island State: a Lesson in Faroese

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ABSTRACT
ICT as an enabler of public sector reform, efficiency and effectiveness gains is a key topic in Public Administration, IT governance and eGovernment literature. Still, little has been written on the application of ICT in the public section of microstates and -dependencies. This article is part of an ongoing case study on the Faroe Islands. The article outlines key features and challenges of microstates and -dependencies before addressing current academic discourse on public administration ICT use and the Faroese context. Past challenges and successes are highlighted, including the importance of political and financial commitment, the introduction of a single Electronic Patient Record, cross-governmental financial management systems and a shared IT service center. The case study concludes by introducing the rational for the focus in the 2016-2020 eGovernment Strategy programme, investment requirements and benefits plus key lessons which may inspire other practitioners and decision makers.

CCS Concepts
• Applied computing~E-government

Keywords
eGovernment; ICT; Public Administration; Strategy; Microstate; Microdependency; Faroe Islands

1. INTRODUCTION
Countries are a mixed bag of administrative and political entities. From large ones such as China and India with billion plus populations, to small countries like the Vatican with 842 inhabitants, and dependencies like ones like Cocos Islands (AU) and Pitcairn Islands (UK) populations 596 and 48 respectively [1]. The focus of this ongoing case study is on the achievements and key lessons learned in the Faroe Islands.

With reference to academic discourse on public sector ICT enabled reform (i.e. digitization and eGovernment) and challenges faced by microstates and -dependencies (section 2) this paper outlines the context and key features of the Faroe Islands (section 3). Past and present eGovernment initiatives, achievements and failures are presented (section 4) before the current focus of the Faroe Islands is outlined (section 5). The paper concludes by outline the next steps and key lessons so far (section 6).

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2. ACADEMIC DISCOURSE
While the introduction of Information Communication Technology (ICT) in public administration may not be a universal solution to the challenges faced by countries today, it is often considered an essential element. The successful use of ICT to increase public sector efficiency and effectiveness has long been the focus of international benchmarking [2, 3] and various case studies [4-6]. Similarly ICT-enabled public sector reform is a focus within public administration research [7-9], IT-governance within computer science [10, 11], and the increasingly independent research field of electronic government and governance (i.e. eGovernment and eGovernance) [12-15]. For the purpose of this article, eGovernment is defined as *"the use of ICT and its application by government for the provision of information and public services to the people"* [3].

Studies have highlighted the successes and failures of various national eGovernment initiatives and strategies. Authors have often highlighted specific failures of these initiatives, including blindly digitizing existing processes, only addressing technology and supply ignoring the outcome and impact of ICT use [15, 16]. Still, little has been written on the challenges faced by microstates and -dependencies and ICT use in public administration.

While "states" and "dependencies" are clearly defined in a legal sense, the definition of "micro" varies. While most agree that the size of population and land areas are key elements, semantic definitions of "state" and "very small" are key grounds of debate in the academic community and between international organizations [17]. Recent attempts to define microstates focus on identifying political entities with unique qualitative features linked to their geographic or demographic limitations [18]. Dumienski et. al. [19] use a qualitative definition of microstates, i.e. *"modern protected states, i.e. sovereign states that have been able to unilaterally depute certain attributes of sovereignty to larger powers in exchange for benign protection of their political and economic viability against their geographic or demographic constraints."*. This latter definition excludes a number of dependencies, which functions like independent states in all but name, e.g. northern hemisphere entities like the Faroe Islands, Greenland (Denmark), Guernsey, Jersey (UK) and the Åland Islands (Finland). For the purpose of this case study, the term microstate will be used for both states and dependencies [19-21].

Microstates have historically been prone to a number of external interventions. Economically, they suffer from the 'concentration phenomenon' and dependent on a narrow range of products (e.g. agricultural and fish products), light manufacturing (e.g. textiles) or services (e.g. tourism, banking, data processing) with little or no influence on the terms of trade. This leaves microstates open to erratic market fluctuations, external political events, weather or crop yields which cannot be predict or preempt [18, 20, 22, 23].

With limited resources available, microstates are even more reliant on exports and favorable international trade conditions, not only for

the provision of food stuff, consumer goods, but raw materials for processing. Limited human and financial resources mean that microstates must source special know-how and investments from overseas. The risk of becoming overtly reliant on a few individuals or firms is high and can be detrimental if a relationship sours – microdependencies face similar risk vis-à-vis their larger country partners. The linchpin of the local economy becomes an enclave beyond domestic control. Financially, a large number of microstates receive considerable largesse from abroad in the form of aid or remittances. These inflows are a regular and vital share to the national balance of payments but also private consumption and investments in the microstate [19, 21, 24-26].

Ecological and natural disasters such as cyclones, epidemics and droughts hits microstates proportionally harder than large countries due to the limited territorial size, heavy reliance on a few key produces and industries. There are even indications that that such a dependence on externalities spills over into cultural and psychological dependence. Smallness appears to increase the likelihood, pervasiveness and legitimacy of penetration [18, 19].

With the challenges faced by microstates and public administration when introducing ICT, this ongoing case study aim to highlight the key lessons learned in the Faroese context and how they may be applied elsewhere.

3. THE FAROESE CONTEXT

3.1 Political and Administrative System

The Faroe Islands is a parliamentary democracy within the Danish constitutional monarchy. The 32 member parliament, Løgtinget, is elected every four years, through universal suffrage and proportional representation. In addition, two members are elected for the Danish Parliament, every four years (representative in numbers to the Faroese population size) [27, 28].

Since 1 April 1948, the Faroes have been an autonomous province of the Kingdom of Denmark and part of the Danish Commonwealth, i.e. Rigsfællesskabet, with its own prime minister but recognizing the Danish monarch as head of state and Danish supremacy in relation to foreign and defense policy [27, 28]

While the Faroe Islands in academic and international terms is defined as a microdependency it shares all the features of a microstate and almost all the features of an independent country – including some of the pitfalls. The lack of political perceptions of their own interests, problems and prospects are significantly shaped and determined by externally constructed, in particular Danish ideas and models of what should be [18].

3.2 Demographic and Socio-economic Features

Orthodox liberal theory of development is the Ricardian one of specialization i.e. the securing and defense of international market niches, reaping wealth from trade based on comparative advantage and economies of scale. Development in the Faroe Islands is in a neo-classical sense, inherently problematic due to the small population and geographical size. The 18 islands are geographically remote, population density is small, with inhabitants spread out over 18 islands and approximately 40% of the population residing in the capital Torshavn (c. 18.000) and an additional 10-20% of Faroese working or studying abroad at any given time [27, 29].

A key challenge, like in many other micro- and island nations, is depopulation. On paper the population should be growing, but aging is a challenges, as in most other Western economies, and emigrations accelerates and amplifies the trend for two reasons. Young people wishing to pursue university degrees or specialized trades, must largely go abroad to study and as 40% of students do not return. Second the work forces is highly mobile, and many travel abroad to work, with a large proportion choosing to settle in the countries in which they work [27, 29, 30].

The economy's narrow spread of sector and labour specialization (e.g. fisheries, tourism and financial services) is a structural inhibitor to the prerequisites of the Ricardian development path. Similarly, local capital is at times scarce (e.g. due to economic down turns in fish stocks or exports) and must therefore be sought from overseas (e.g. from Denmark) [30]. Entrepreneurship is also perceived as lacking, the locals being dismissed as deficient in organizational skills, technical know-how and risk orientation [26]. On the demand-side, the limited domestic market renders almost all productive activities uneconomical, unless a substantial export outlet is developed – as in the case of fisheries or exceptions' like subsistence agriculture and cottage industry [26].

As illustrated in table 1, the Faroes is a high income country, with low levels of unemployment, but heavily dependent of fishing and sheep farming. In fact, 98% of the Faroese export is coming from the sea, mainly fishery and fish farming (salmon). Crises in these industries have had a major impact on the Faroese economy in recent years. The 1990's collapse and bankruptcy of the fishing and finance sector, galvanized politicians, industry and society and has led to a focus on economic diversification [31]. Notable growth sectors include salmon farming and processing (natural fit) – which has helped diversify the industry somewhat in the last 20 years. – high-end wool and textile manufacturing (albeit often as a cottage industry), tourism (particularly cruise ships and stopover tourists between Denmark and Island – also a main transport route), bank and financial services (mainly into Denmark) [30].

Table 1. Key statistics [29, 32]

Population	48.846
Territorial size	1.399 km2
Population density	34 per km2
Official languages	Faroese, Danish
Ethnic groups	91.7% Faroes, 5.8% Danish, 0.4% Icelandic, 0.2% Norwegian, 0.2% Polish
GDP 2013	€ 1,966.88 million
GDP per capita 2013 (approx.)	€ 40,977
Unemployment April 2015	3,0%
Imports January-April 2015	€ 223.64 million
Exports January-April 2015	€ 257.80 million

4. ICT AND PUBLIC SECTOR REFORM

In light of the 1990's crisis, demographic and socio-economic challenges the public administration and successive government have tried to modernize the public sector, create shared services centers, reform local government by merging the 32 existing municipalities into larger units etc.

ICT use in public administration is seen as a potential tool to increase efficiency and effectiveness of the Faroese public sector, but also to minimize administrative burdens for industry and private entrepreneurs. Thus the Faroe Island's approach to eGovernment differs from neither classical academic literature nor the ambitions of other countries.

In terms of internet availability and use by the general public, the preconditions are in place. Despite only two national providers of telephony, cable and mobile internet, relative high prices for a limited maximum capacity of 20mb per second, 90% of Faroese have internet access at home [32]. As illustrated in figure 1 this including good take-up rates in remote areas and in older age groups. Similarly, mobile phone penetration is high. In an international context this is on par with other Nordic countries and even ahead of countries such as Australia, Canada, Japan, Singapore, South Korea, the US or UK [33]. The government and telecom industry in 2014 joined up with Huawei for rolling out a new generation 4G/LTE network, thus becoming a large scale testing ground for Huawei's newly developed technology [34].

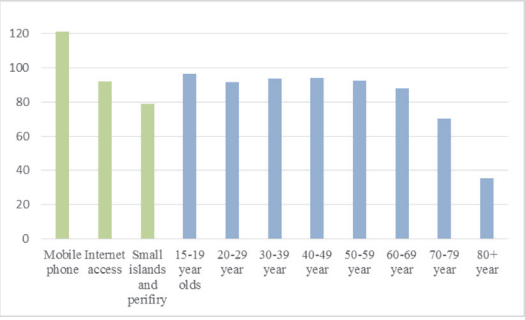


Figure 1. Internet and mobile phone penetration (2011) [32]

4.1 Achievements to Date

To date the core public registers and services have been digitized, including tax services, tax numbers for all legal entities, unique personal identity numbers [34, 35]. Notable successes include a centralized financial system (BSL) covering the entire public sector including central authorities, agencies, municipalities and state owned enterprises. As a result public sector allocations, spending and projections are available instantaneously and have improved decision making processes, financial management and minimized budget overruns across the board [36].

The national Electronic Health Record (EHR) is a unified system covering hospitals, clinics, general practitioners and pharmacies. This means that a citizen in the Faroes have a single health record, have increased health sector efficiency, minimized medical errors and gives the individual patient insight in their own medical history. Interestingly the project was developed and implemented in less than two years [30, 34, 36].

For the public sector a shared and centralized ICT Agency (KT landsin) has been established, in order to hosts and manage most of the public IT systems and registers [30].

4.2 Key Challenges

The main challenges affecting cross-public IT solution, like the BSL and EHR, has been resistance from public institutions and municipalities to follow and comply with decisions made by politicians and authorities at central level. In relation to project development and implementation the key challenge was to identify the relevant technical and managerial skills for complex ICT and change management initiatives domestically [30, 36, 37].

Although most of the public registers are digitalized, some remain. There is still no unique business registers (although the tax numbers may act as such) and there is no complete registers for buildings and properties [30, 36].

Similarly, there is a lack of internet based services from the public sector to citizens and business, partly due to the relative large number of municipalities (32 for a population of 45.846). The lack of a unique and secure national digital identity or signature (eID), means that many of the online services are very simple and often constitute downloadable pdf forms rather than transaction or even personalized digital services. Lastly, there have been not coordinated cross-governmental efforts to promote the development more sophisticated transactional services or the actual use of the digital service delivery channel (bar a few like tax) [30, 35].

Unfortunately a general lack of political willingness have so far hampered the developing and implementing reforms of public service delivery and administration. Similarly a lack of funds for IT and digitization projects and limited access to e.g. EU funds for investment and research purposes amplifies this aspect [28, 30].

5. FUTURE DIRECTION

To build on the achievements to date and address the socio-economic challenges faced the Faroes Ministry of Finance and Ministry of Trade and Industry have initiated the development of a new eGovernment Strategy for the period till 2020. For this purpose € 0.3 million, has been allocated on the 2015 state budget, to consult public and private stakeholders, citizens and businesses, identify good practice examples abroad and coordinate the development of the Strategy [30, 34, 38].

While the eGovernment Strategy will only be proposed to government for adoption at the end 2015, four priority areas have emerged: A central it-architecture for connecting core IT-systems; a national digital identifier and signature; the development of a central one-stop-shop service portal, and; improved governance and cooperation structure [30, 38].

5.1 Data Exchange and Reuse

Core data and registries is already digitized in the Faroes, including economic and tax data, cadastral information, address databases, population data bases, health data etc. The challenge is to ensure data quality and that authorities can reuse the data in an easy, cost effective and secure manner [30, 39].

Following research and study visits to Denmark and Estonia in 2015, a local adaptation of the Estonian X-roads concept is being recommended for implementation (see figure 2). The local adaptation builds on existing secure data distribution network (illustrated in figure 2, as the secure data exchange hub through which organizations are directly linked in order to transfer data) and international standards for enterprise architecture and interoperability (IOP) already in place - including exchange data with registries in the Danish public administration (e.g. for passports). The introduction of X-roads will be gradual, allowing for secure data exchange of encrypted parcels of data via the internet (illustrated in figure 2, as links via a cloud). The gradual approach allows soft launch, spread of cost and risk over time.

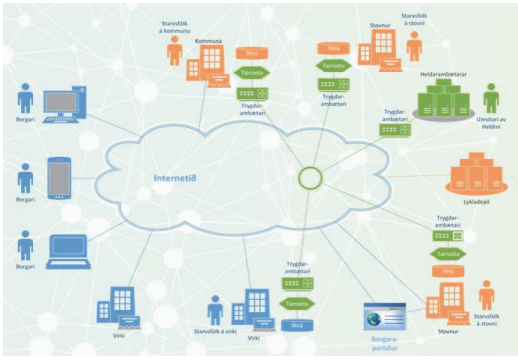


Figure 2

To minimize cost and maximize flexibility the Faroese have focused on proven models for data exchange in a national and international context. As secure government networks are too expensive for the Faroese to roll-out and maintain the focus is on secure data exchange via the internet (illustrated in figure 2, by authorities linking to the cloud and transferring encrypted parcels of data), hence the choice of the X-roads [37-39].

5.2 Digital Identity and Signature

Currently a simple user-name and password solution exist in the Faroe Islands. The MinLykil (or MyKey) is linked to the unique national identifier for citizens the so called person-number (or p-number). In structure and purpose it is similar to ID-numbers in the other Nordic countries, including the Danish Central Person Register number (or cpr-number). For business, public authorities and other entities a unique identifier is being considered [37].

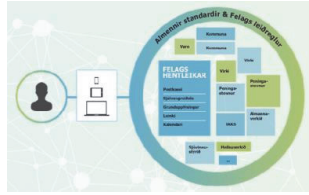
MinLykil is used to access online services (eService) such as tax, health care, the EHR and the personal postbox and archive, MinBoks (or MyBox). Unfortunately the encryption core of the system is obsolete and the system needs to be updated in order to take online service delivery to the next level – including allowing for digital signature and personalization of eServices [35, 37].

Key outcomes explored includes multiple identification forms, incl. simple identification (i.e. no login required), identification (login and password), and signature (login, password and confirmation of signature). Similarly, data must be stored in the Faroes (i.e. digital sovereignty). To ensure take-up and value added for citizens, businesses, the public and private sector one national solution is a requirement (also key to the successes of eID roll-outs in Estonia, Denmark and Iceland). Due to high penetration of mobile phones, cost consideration, successful roll-out in e.g. Estonia, Iceland and Norway the initial focus will be on the roll-out of a sim-card/mobile phone based solution [37, 38].

5.3 Services

Some services are already provided on digital channels. Key examples are online tax applications, transport subsidies and tax deductions, applications for day care. For some almost 100% of service volume is online (e.g. annual tax return), for others, like application for day care and schools varies from one municipality to another e.g. approx. 45% of daycare applications are digital in Torshavn while other municipalities have no online presence (not even a website) or only downloadable form [35]. The interaction with public administrations is therefore fragmented and inconsistent, often confusing citizens and businesses [35]. The focus on online service provision in a Faroese context is inspired by experiences in Denmark, Estonia and the UK in particular [35]

The introduction of eID and an effective data distribution infrastructure will allow authorities to increases the level of personalization online, but also enable back-office automization. To this effect the strategy propose a two-steps approach to online the user-experiences: The first step is to launch a single one-stop-shop consisting of existing online services. Using responsive web-design information and eServices will be accessible from all devices without maintaining different operation systems and solutions for e.g. PC's, tables and mobile devices. The approach also allow experimentation with user centric service design and delivery (see figure 3), eventually leading to a second step focusing on proactive and personalized online service delivery. The aim is for two-fold: To ensure that the online user experience is value adding and on par with traditional service delivery channels, and; through channels strategies, user-centric service design, eID and data reuse and automization to increase back office efficiency. eID, digital signature and data via the X-road framework are essential to efficient identity management, give citizen assess to personal data, and reuse data across the public sector for effective service delivery [30, 35, 40].



Step 1: National one-stop-shop portal

Step 2: Proactive and personal service

Figure 3. Two step process to personalized online service [38]

5.4 Governance, Cooperation and Legislation

Key lessons in the Faroe Islands revolves around changing political priorities and commitments, resistance to change from public authorities and a lack of funding for the appropriate investments. When successful administrative burden reduction and efficiency has been achieved in the Faroes, it has been targeted, like the centralized financial systems (BSL), EHR, and the shared ICT services center KT Landsin [30, 34, 36].

As a result the eGovernment Strategy focus on a new governance structure to ensure cross-governmental cooperation, development, implementation and use. Legal barriers to successful digitization are to be identified and addressed in a coordinated manner. Similarly gaps in existing legislation must addressed e.g. in the field of cyber security, mandates to ensure compliance with ICT and data exchange and interoperability standards etc. [41, 42]

To support the introduction of a new governance structure, the development of the eGovernment Strategy is directed by a joint-governmental steering committee, with a mandate from the Minister of Trade and Industry. Representatives from the Prime Minister's office, Ministry of Finance, tax authority, private business and municipalities. The working groups are coordinated by KT Landsin and the Ministry of Finance which has been given the secretariat role for the eGovernment strategy by the Ministry of Trade and Industry – thus sending a strong single of sharing responsibility, illustrating the importance of cooperation and the Strategy itself. Working groups are established for core focus areas

and initiatives. Working groups are outcomes orientated and consists members from a multitude of relevant public authorities and external experts from the Faroe Islands, Denmark and Estonia. The aim is to ensure commitment and ownership, look at the public sector holistically and minimize the risk of failure. In addition interviews, workshops and large scale public consultations have been the norm [30, 43].

6. NEXT STEPS AND LESSONS LEARNED

The work with the 2016-2020 eGovernment Strategy has so far focused on identifying and fine tuning the objectives and topics to be address. A second core focus have been introducing the strategy to the public. An open consultation event was successful organized in June. The objective of the event was to give a voice to anyone who wished to do so, for politicians to take the strategy's considerations in to account, in the September 2015 election and not least create awareness. With close to 0.5% of the population participating in the event itself, high level of media coverage and debate the event is considered successful. As a result the Minister of Finance has an appropriation of € 1.33 million to the digitalization of public services on the temporary budget for 2016 [30, 34, 38].

The estimated implementation and running costs for 2016-2020 eGovernment Strategy programme is €29.91 million. The estimated budget includes €0.3 million for the research, external consultants, and strategy work in 2015, €9.40 million for data exchange infrastructure, including data quality assurance and data exchange Implementation and running costs for 2016-2020 is estimated to be €6.38 million, including the potential issuing of physical picture and chip ID-cards (up to 2/3's of costs) and sim cards for the mobile solution. The development and running of the national eService portal is estimated to be €2.15 million for 2016-2020, including developing and enforcing minimum usability requirements for content and services. Current focus is thus to qualify budgets, identify sustainable finance models for the development and subsequent maintenance and running costs – including co-financing from banks and telecoms [34, 37-39].

While the Estonian estimates the annual savings form eID and digital signature use to a full 2% of GPD, Faroese estimations are more conservative at 1% of GDP or approximately €20.14 million annually. The estimated socio-economic benefits needs to be qualified further in the coming phase of the eGovernment Strategy but consists of: Government costs savings from the reuse of government data; Introduction of eID and digital signature; Administrative burden reduction benefitting citizens and businesses when using digital and analogue services; Further development of shared services at State IT; Increase online self-service, proactive and personalized service online [36, 38, 43]

If this is approved it will be used to develop and implement the strategy. First step will be developing and implementing a national digital identity and signature.

To conclude, the Faroe Islands experience highlight, that even microstates and -dependencies with their limited resources can use ICT to successfully modernize their public administration. What is also evident from some of the initial successes is that microstates can achieve noteworthy successes in eGovernment such as EHR, sound financial systems which increase the transparency and efficiency of budgetary management.

Still, the Faroese experiences also bring to light some key lessons including: Ensuring political and financial commitment from the onset; Develop the eGovernment Strategy jointly with key stakeholders to ensure joint ownership and commitment; Look at ICT as an enabling tool only once legislation, processes and back-office organizations have been streamlined; Be creative in solutions but borrow from successful public and private solutions elsewhere – in particularly to minimize risk and cost, even if this means compromising on certain aspects.

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Article VII

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eGovernance and Online Service Delivery in Estonia

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ABSTRACT

Estonia's use of Information Communication Technology (ICT) in the public sector is regularly highlighted as an innovative model worth emulating. Despite this, research into the Estonian governance and inter-governmental cooperation model is limited, with most being 5-10 years old. In addition, recent literature reviews point to a limited understanding of technology use in public service delivery and the role played by governance, inter-governmental decision making and cooperation when introducing ICT solutions and online services to citizens.

As part of a larger qualitative, multi-country comparison, this article analyses the Estonian approach to electronic governance (eGovernance) and inter-governmental cooperation. Initial findings highlight the strength of the Estonian tradition of politically driven and motivated public sector modernisation, a consensus seeking and inter-governmental approach to eGovernment, trust between actors, the role of informal networks and cooperation with the private sector. The Estonian case thus supports academic arguments in favour of a strong eGovernance model and a high level of inter-governmental cooperation and decision making. While successful in relation to ICT infrastructure, standards, roll-out to key enablers and internet voting (iVoting), the article highlights the potential benefits of formalising informal networks and streamline the governance model to minimize the risk of failure if consensus cannot be reached, if personal and institutional capacities and contacts does not exist.

CCS Concepts

• **Information systems**

Keywords

eGovernance; eGovernment; eService; use; inter-governmental corporation; evaluation; Estonia

1. INTRODUCTION

Two images are often associated with Estonia: pictures of the picturesque capital of Tallinn and articles on the innovative use of ICT (Information Communication Technology) in public administration. From internet voting (iVote), broadband access and government IT infrastructure, tech savvy business, innovation and the ability of non-Estonian residents to be electronic residents and set up their businesses in less than five minutes online, the ICT successes are many. But how has a small middle income country in northern Europe seemingly succeeded where others have not?

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From public administration (PA) [1-6], to information systems (IS) management [2, 3, 7-10], to electronic government and governance (eGovernment and eGovernance) [11-16], academics have highlight the failures of IT and technology use in the public sector. Mistakes include blindly digitising current processes [13, 16, 17], focusing on technology and supply [18-20] rather than value-adding outcome and impact of ICT [4, 21, 22] – not only in relation to IT and technology use in public administration but even more so in relation to online services (eService) for citizens [20, 23].

Since the late 1999s, the so-called stage and maturity models have been the primary focus and tool for academic, private sector consultants and international organisations in assessing the relative success of countries in eGovernment and online public service delivery. Multiple authors – including Meyerhoff Nielsen's 2016 review of public sector reform, IT governance, and eGovernment literature [23] – finds that the current maturity models only address supply-side and technology issues, but do not fully understand public service delivery and production, and only a few organisational issues. Similarly, the maturity models and current research do not adequately address the role of governance and cooperation in ensuring the successful supply and use of online eServices. [8, 20, 23-25].

In fact, front-office service provision and back-office integration are mixed-up in numerous maturity models. One-stop shop portals do not constitute a form of transaction, but are an indicator of the degree in which authorities cooperate and integration in the provision and production of services via a portal [20, 23]. Heeks attempt to address this by proposing a two-dimensional matrix model distinguishing between the front- and the back-office [26]. Unfortunately, Heeks does not account for eGovernance or take-up [25].

Similarly, none of the analysed maturity models addresses governance directly [23, 25]. Davison [27], Iribarren et. al. [8], Janowski [28], Kalambokis et. al. [29], Shareef et. al. [30] and Waseda [31] models highlight management and coordination issues, such as the existence of chief information officers (CIO). Cooperation, on the other hand, is indirectly addressed in most models. This is manifested in terms of vertical and horizontal integration, and the existence of one-stop shops, the sharing of information and data between different authorities and levels of government – even private and third party stakeholders [25, 32, 33].

There is therefore a need to look at eGovernance and inter-governmental cooperation in isolation from the mechanisms of public service delivery and how ICT is used in this regard. While *eGovernment* refers to "the use of ICT and its application by government for the provision of information and public services to the people" [34], *eGovernance* comprises the processes of governing, whether undertaken by a government, market forces, social networks (e.g., families, tribes, professionals), formal or informal organisations, a geographical territory, or via laws, norms,

power, or language [34]. Thus, e*Governance* refers to the governing bodies responsible for the successful introduction of eGovernment solutions like online public services. By comparison, *cooperation* refers to activities engaged by various parties toward a shared purpose.

To cast light on the role of eGovernance and inter-governmental cooperation in the successful supply and citizen use of eServices, this article presents and analyses the often mentioned and influential Estonian case. The aim is two-fold: to *identify the Estonian features and lessons learned in relation to the role of eGovernance and inter-governmental cooperation* and to *add the Estonian lessons to a future cross-country comparison*.

The article is structured as follows: the methodology and conceptual framework for the case is outlined (section 2), the Estonian context and case is presented in relation to the conceptual framework including background indictors and preconditions (section 3), the national approach to governance, cooperation model and eGovernment (section 4), key enablers and services in place, effect measurements and achievements (section 5), before the discussion and conclusions are presented (section 6).

2. METHODOLOGY

To address the research gaps in relation to eGovernance and inter-governmental cooperation [23], a classical exploratory, qualitative, multi-country case study methodology framework [35-37] is applied to enable a with-in case analysis.

An adapted version of Krimmer's context, content, process model (CCP model) [28] is used as it provides a framework for the individual cases across four relevant macro-dimensions: Background socio-economic indictors (section 3.1) and ICT related pre-conditions (section 3.2); national governance and cooperation model (section 4.1); national approach to eGovernance and eGovernment (section 4.2); and effect measurements (section 5). Each dimension explains a key area that influences processes, choices and outcomes in relation to eService supply and take-up. Using the framework for the with-in case analysis help isolate the eGovernance and inter-governmental cooperation mechanisms in play and to draw out specific aspects and lessons.

The consistent application of the conceptual framework across multiple cases allows for the future cross-country comparison to determine the correlation (i.e., the more of Y, the more X) between a strong cooperative eGovernance model (cause) and the introduction of online services (effect 1) and subsequent citizen use of the online service delivery channel (effect 2).

Using the conceptual framework, this article identifies Estonia's respective strengths and weaknesses in relation to the country's approach to eGovernance and its eGovernment experiences since 1991, but with a particular focus on the period since 2010.

Estonia has been chosen for three main reasons: it is an often cited and is an influential example of successful government use of ICT and online public service delivery; it is a small, centralized, middle-income country complimenting the Faroese [38], Danish [39], Georgian [40], and Japanese cases [41] analysed by the author, but is also a relatively under-analysed governance model [35, 37, 42].

Primary sources used include relevant academic literature and international references from EU and OECD, relevant policy documents, national and international statistical sources, e.g. Eurostat [43] and International Telecommunications Union (ITU) [44] and UNDESA's eGovernment Readiness Index [34, 45, 46].

3. BACKGROUND

As a result of history and culture, countries operate in different contexts and offer different perspectives and experience when it comes to online service provision for citizens. Similarly, population size, income levels, administrative systems and complexity of these systems varies. It is therefore important to put things in context.

3.1 Socio-economic background

Estonia is, in socio-economic terms, a small and sparsely populated country. While an OECD member – the first former communist country to gain membership – it is a middle-income country. Estonia is an open-export orientated economy with productivity and GDP growth and a start-up mentality. Considered a nation state with a strong identity, Estonia also has a large Russian-speaking minority and an ageing population (due to immigration and low birthrates) [47]. For details see key statistics in Table 1.

Table 1. Key socio-economic statistics 2016 [47]

Population	1,258,545 (July 2016 est.)
Territorial size	1.399 km2
Population density	34 per km2
Official languages	Estonian
Ethnic groups	Estonian 68.7%, Russian 24.8%, Ukrainian 1.7%, Belarusian 1%, Finn 0.6%, other 1.6%, unspecified 1.6% (2011 est.)
Median age and life expectancy	42.4 and 76.7 years
Population growth	-0.54%
Urbanization	67.5%
GDP 2015 (est.)	€ 35.64 billion
GDP per capita 2015 (est.)	€ 25,433.46
Unemployment 2015 (est.)	6.2%
Imports 2015 (est.) Exports 2015 (est.)	€ 12.52 billion € 11.62 billion

3.2 Internet access and use

For online service delivery to succeed, internet access and a minimum level of digital literacy and competences are essential pre-conditions. As an indicator of the level of digital literacy, the actual use of the internet, online banking and shopping sites are used (eBanking and eCommerce, respectively). To put Estonia in context, average for the EUs 28 member states is include in Table 2.

Table 2. Individual and household access to, and use of the internet, 2010-2016, selected years (EU28 country average in brackets) [43]

	2010	2013	2016
Household internet access	67% (70%)	79% (79%)	85% (86%)
Individual with mobile internet	33% (21%) (2011 data)	33% (24%)	26% (27%)

Individual using the internet (at least once a week)	71% (65%)	77% (72%)	85% (79%)

Data shows that the vast majority of Estonian households choose to pay for internet access and that most Estonians are online almost daily. The key pre-conditions for introduction online government services and citizens subsequent use of them therefore exist in Estonia.

4. eGOVERNMENT AND GOVERNANCE

Public sector use of ICT has been actively pursued in Estonia since independence in 1991. A political willingness to innovate, work with the private sector and transform the public sector has been key [48-51]. The strategic focus and governance model in place is therefore helpful for understanding the Estonian context and eGovernment outcomes.

4.1 Strategic focus since 1991

The Estonian eGovernment focus has consistently focused on five core areas. The first two, infrastructure such as affordable internet availability and digital literacy are essentially preconditions for any form of large scale digital transformation, information society and digital economy. The next three includes: electronic identification (eID), which contains the secure authentication of users by digital certificates embedded in ID or SIM cards; digital information covers information systems and databases at all levels of government, and lastly the formalized exchange of content through the X-road data exchange service layer for connected databases [52, 53]. Over time the importance and strategic emphasis has naturally shifted, as described in Table 3.

Table 3. eGovernment in Estonia, 1998-2020 [52-55]

1998-2003 Principles of the Estonian Information Policy	The first eGovernment strategy focus on the: promotion and entrenchment of democracy, development and roll-out government ICT infrastructure; increase competitiveness esp. through de-monopolisation; increase the speed post-Soviet property restitution, develop eCommerce and eBanking; sustaining Estonian culture and language, and; improve State defence utilising ICTs.
2004-2006 Estonian Information Society	Aligned to the EU Europe 2002 and 2005 action plans the objectives incl.: introduction and promotion of citizen, business and intra-government eServices; roll-out of ID-card (incl. eID); promote internet access and use through training (incl. reaching EU average, 1 PC per 20 students in schools); increase public sector productivity though ICT (incl. document management and archiving, improved registries and data, launch of X-road); economic growth and export capacity of the ICT sector; promote ICT security, and; international promotion and improved “eGovernment position”.
2007-2013 Estonian Information Society Strategy 2013	Closely aligned to the EU i2010 eGovernment Action Plan the focus is on infrastructure underpinning the promotion of a knowledge-based society and economy. Objectives incl.: multi-channel service delivery, WCAG compliance of government websites, more transparent and user-centric eService’s; improve digital literacy with 70% of Estonians using the internet; 80% user satisfaction for citizens and 95% for business; 15% of GDP is generated by the ICT sector and productivity levels are at least 75% of the EU average. Separate broadband and cyber security strategies were launched in 2011 and 2012 respectively, as well as for local government (2008-2011), a programme for increased awareness (2007-2011)
2014-2020 Digital Agenda: Estonian Information Society Strategy	Focus on: smart solutions and enabling infrastructure such as, 100mb per second internet country wide; 60% of Estonians use the internet daily; 20% of the population use eID/eSignature; update eService usability standards and uniformity across government; provide technical and organisational infrastructure for citizens to use and control their personal data; increase cross-border cooperation on data exchange, eID, eSignature etc.; promote eResidency, and; improve policy and decision making framework. Health care (2014-2020), education, business environment and cyber security (2014-2017) are set out in other strategies.

Policy wise, Estonia is an early mover, launching its first eGovernment related strategy in 1998. Related eGovernment legislation is found to be introduced neither earlier nor in a distinctly different form or quality than other central and eastern-European countries [48-50, 56]. The initial strategies are closely aligned to the 2000 Lisbon Agenda and EU policies aiming to make Europe the most competitive knowledge and information society in the world by 2010. The focus has very much been on infrastructure roll-out, key enablers and use including broadband access, digital literacy, backend IT systems, eID, eSignature, iVoting and the supply of online services. Since 2014, the use of eServices and user-centricity, artificial intelligence, data and once-only principles, eParticipation and the governance model – all have traditionally received relatively little strategic attention – are in focus.

Historically, Estonia has spent a minimum of 1% of the annual budget on ICT and information society related activities [48, 51]. More than €62.6 million were spend in the period 2007-2013 and €200+ million is expected for the Digital Agenda 2014-2020 [52, 55]. Interestingly, an estimated 85% of government spending on ICT comes from EU Structural Funds [52]. The use of EU funding as provided the necessary investments by an otherwise cash strapped government, especially in the first decade of post-Soviet independence. The use of EU funds is possible due to the close alignment between European and Estonian strategic objectives in the eGovernment. The strategic alignment of early strategies to EU policies is a natural consequence of the 1991 independence from the Soviet Union, the political drive for an ICT supported modernization of the public administration, facilitating growth in

an already established technology sector and promise of future EU membership [48, 49, 51].

The Estonian strategic focus on infrastructure roll-out, accessibility, digital literacy, standards, key enablers, backend systems, and subsequently eService supply and subsequently take-up reflects similar patters seen in Europe, the former Soviet Union and beyond (albeit at different pace) [34, 41, 45, 46, 53, 57-60].

4.2 Governance model and institutional framework

Estonia is in many ways a small and highly centralized country. The central government institutions are few and provide most public services for citizens. The country has no regions as such, and its counties do not provide any citizen services of note. Except the four main urban centers (Tallinn, Tartu, Narva and Pärnu), local authorities have limited capacities and provide only a few services. This is not expected to change despite the 2017 structural reform of local government, which will merge 183 rural municipalities, often with less than 3,000 inhabitants, and 30 city municipalities. While the guided minimum is 5,000 but ideally 11,000 inhabitants [61] the new municipalities will continue to have limited financial and human resources to provide more than limited portfolio of citizen services, let alone any number of online services. Table 4 summarises the general approach to public service delivery in Estonia.

Table 4. General governance and institutional framework [53, 54, 62]

	Estonia
National institutional framework and governance	Centralized. Small size of country, service delivery and ICT related issues concentration on a few key national ministries and agencies. High number of municipalities with limited service delivery capacities.
Decentralisation of government authority	Limited, due to small size of country, high number of municipalities with limited capacities.

Like governance in general, Estonia's approach to ICT reflects the country's context, experience and public sector capacities, including decision making processes, the degree of cooperation between authorities and different levels of government, the private sector, civil society and research community.

Politically, Estonian policy has since 1991 been dominated by a center-right laissez-faire attitude to the role of government and public finances, but simultaneously been influenced by the Nordic approach and welfare model. The result has been a relatively small public administration, a focus on public private partnerships, outsourcing, a high level of fluidity between the public and private spheres, consensus seeking and a high level of trust [48, 49, 51].

Historically, policies, strategies, action plans and institutionalized processes have often been fragmented or lacking. Focus has been on implementation rather than on formal processes or system documentations – exemplified the overly complex pre-2014 eGovernance organigram in Figure 1 [49, 54, 62]. The success of Estonia has been based on the political vision and willingness to innovate, replace legacy systems, scrap old processes and legislation. This has been facilitated by the informal networks, personal contacts and trust which characterize Estonia's public sector [49-51].

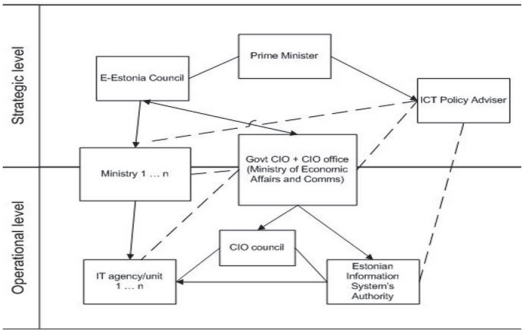

Figure 1. Pre-2014 eGovernance and coordination model [63]
(Note: Full and broken lines represent formal and informal network structures, respectively)

Table 5 summaries the Estonia approach to ICT and its governance set-up introduced with the 2014-2020 Digital Agenda.

Table 5. eGovernance and cooperation actors and responsibilities [52-54, 64]

	Estonia
Responsible authority for eGovernment strategy	On the strategic level, the Information Society Council (ISC) (sometimes known as the e-Estonia Council) is chaired by the Prime Minister and provides the strategic vison, direction and overall horizontal and vertical coordination. On the operational level, the Ministry of Economic Affairs and Communication (MKM) is the mandated and regulatory authority, with a dedicated Department of State Information Systems (RISO) for initiating, coordination, monitoring and auditing the strategy. The national (e)government CIO and office is also housed in the MKM.
Responsible authority for action plan	On the strategic and operational level, MKM and RISO is responsible for initiate, drafting, coordinating and monitoring the action plan, but is accountable to the ISC for strategic direction and horizontal coordination (if so required). MKM/RISO is supported by thematic work groups and networks which are formed to coordinate individual action plan initiatives on a daily basis (in line ministries etc.).
Responsible authority for initiating and coordinating new eGov strategies and action plans	MKM and RISO is responsible and mandated to initiate and coordinate new strategies and action plans but must follow the direction given by the ISC. MKM/RISO is supported by thematic work groups and networks which are formed to coordinate individual action plan initiatives daily (in line ministries etc.).

Chairperson organisation	Prime Minister chair the ISC and is supported by the vice-chair, the Minister for MKM.
Hosting organisation and secretariat	Prime Minister's office, supported by MKM/RISO.
Member organizations	Prime Minister's Office, MKM, national CIO, Ministers of Entrepreneurship, Minister of Education and Research, Minister of Public Administration, Estonian Association of IT and Telecommunication. Other ministers and representatives invited if relevant.
National governance and cooperation model	Hybrid model, i.e. centralized in relation to strategy and policy development, but decentralized and uncoordinated in relation to municipalities – not represented in the ISC or in MKM/RISO. MKM/RISO has the regulatory responsibility for eGovernment including initiating, drafting, coordinating, monitoring strategy, action plan, legislation, budget etc., with Department of Information Society Service Development (ITAO) providing service quality standards and channel strategies and the Estonian Information Systems Authority (RIA) responsible for the national portal www.eesti.ee, the Public Key Infrastructure (PKI), EEBone network, State information system, X-road data exchange, some legal aspects.
Process of eGovernment strategy and action plan development and approval (from idea to approval by government)	Centralized, initiated and coordinate by RISO, but hybrid as MKM/RISO is responsible to the ISC which provides the vision and strategic direction. Intra-ministerial co-operation group provides input to ensure stronger links between the ICT policy and other national policies that influence the development of the information society (e.g. entrepreneurship and education policy). Additional input from the work groups of the Information Technology and Telecommunication Association and the eGovernance Academy.
eGovernment strategy legality	Yes, partially, as part of the government programme.
Action plan (i.e. is the strategy underpinned by an action plan)	Yes, but generally in 2-year intervals and adjusted annually. KPIs been introduced with the Digital Agenda 2014-2020. From 2015 underpinned by the mandatory provision of a business case analysis for ICT initiatives budget approval.
Action plan legally binding	No.

As outlined in table 5, the Estonian eGovernance and inter-governmental cooperation model retain a relative level high level of complexity. It can nonetheless be boiled down to three layers: The strategic level, the operational level and the daily implementation level.

At the strategic level the eGovernment strategic direction and vision is defined by the Prime Minister, the Minister of MKM – in practice the mandated and responsible authority for eGovernment – the national CIO, key ministers and stakeholders from the private sector within the ISC. Key responsibilities include: discussing and approving the draft and final strategy, action plans, terms of reference, draft and approve policy and legislation, and; regular and final evaluation and monitoring reports incl. EU Structural Funds use on ICT [52, 53, 55].

At the operational level, MKM and RISO are key. Their roles were redefined with the 2014-2020 Digital Agenda. While individual authorities are responsible for the actual implementation and daily management of programmes and projects, this is supported by the CIO network. The aim is to ensure everyday cooperation in the execution of activities laid down in the national eGovernment strategy and action plan. The CIO network is led and hosted by RISO, while members include relevant officials responsible for the ICT development in all ministerial areas, as well as the representatives of local authorities and the ICT sector. The CIO network is responsible for the overall coordination, cooperation, conflict resolution and exchange of information related to ICT projects and action plan initiatives. MKM/RISO and the CIO network may establish thematic or task-based work groups and networks if required by the deemed necessary to a successful implementation of the action plan or if required to ensure the individual programmes and projects are coordinated appropriately. MKM/RISO may also initiate bilateral or multilateral meetings with ministries to harmonise the execution of sectoral strategies with ICT components (e.g. in education and healthcare) which are not covered by the eGovernment strategy and action plan. MKM/RISO may also agree or report on actions laid down in the work programme and can escalate issues to the ISC [49, 53-55].

While not illustrated in the pre-2014 eGovernance organigram in Figure 1, the daily implementation has always been decentralized to responsible line-ministries and authorities. From 2014, a co-ordination mechanism has been introduced in the form of thematic or task-based work groups and networks (e.g. records management council, expert group on interoperability, etc.). Each thematic work group and network is responsible for the implementation of their respective action plan initiatives and report to the CIO network on progress, risks and for potential conflict resolution. That said, it is not clear if the individual networks can escalate unresolved issues to the CIO network or MKM/RISO, and who in turn may escalate issues to the ISC. While thematic work groups and networks report to the national CIO network, their number and focus is decided by either the CIO network itself, the MKM, the ISC or the government cabinet (based on proposals from the Council or the Minister) [55].

With the 2014-2020 Digital Agenda, a vision-network has been introduced in Estonia. The role of the vision-network is to identify new trends and patterns at home and abroad, monitor and recommend adjustments to achieve the national eGovernment and information society vision across government and all sectors. The vision-network consists of invited key opinion makers and experts from the public and private sector, academia, and civil society. The vision-network generally exchanges ideas and works on an *ad hoc* basis. The vision-network is hosted jointly by the ISC and the MKM [55]. The relationship between the national CIO (embedded

in MKM and a member of the ISC) and RISO is unclear, but there seems to be a division of labour, with the CIO focusing on the eResidency programme and international corporation. The model is summarised in Table 6 and illustrated in Figure 2 below, and also illustrates the overlapping authority and mandates for implementation of the action plan and initiatives, coordination in relation to the eGovernment strategy and the wider areas of the information society.

Table 6. eGovernance and coordination model since 2014 [55]

	Co-ordination of the implementation of strategy	Wider co-ordination of the development of information society
Vision		*Vision networks*
Strategy	*Information Society Council*	
Implementation of action plans	*Information Society Council and MKM / RISO*	*Discussions between ministries*
Daily implementation and everyday work	*CIO network and Thematic work groups / networks*	

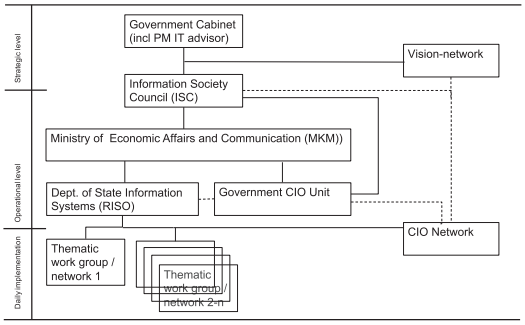

Figure 2. eGovernance and coordination model (by author)

(Note: Full and broken lines represent formal and informal network structures, respectively)

5. KEY ENABLERS, CITIZEN eSERVICES, THEIR USE AND IMPACT

Having confirmed that the required infrastructure and digital literacy exists (section 3), outlined the strategic eGovernment focus over time and described the governance and cooperation model (section 4), what has Estonia achieved in terms of the roll-out (supply) of key enablers and citizen eServices, actual outcomes and impact (i.e. demand and use)?

The availability and use of eIDs, digital signatures and eServices constitutes an effect and impact measurement of eGovernment activities but also the efficiency and effectiveness of the eGovernance model applied and the level of inter-governmental cooperation. eIDs and digital signatures are important as key enablers for government provision of more advanced online service provision such as personal and proactive service provision and not least citizens eService. They allow for the secure and reliable identification of individuals, secure completion, submission and storage of information and data provided during an online transaction, and the legally binding signature of electronic documents and transactions. The type and number of service areas in a country vary depending on a natural context or a given service areas. To trace the impact over time and in real terms, and allow for the future cross-country comparison, the EU 12 benchmarking citizen service is used as a basis for the effect measurement. The EU benchmark consists of high-frequency, high-volume services, relevant in most national contexts and to a majority of citizens or specific target groups.

The existence of key enablers, such as eIDs, digital signatures and various eService's is relatively easy to verify through the national one-stop portal (www.eesti.ee) and relevant government websites. The role of early EU wide strategies and action plans (i.e. the 2000 Lisbon Agenda, Europe 2002 and 2005, i2010 and later Europe 2020) should not be underestimated and means that 12 citizens and 8 business orientated, high-volume, high-frequency (some may say universal services) are available online in most European countries, including Estonia. The existence of eID/eSignature, digital post box solutions and a few select number citizen service areas are confirmed in Table 7.

Table 7. Individual use of the internet 2014-2016, selected years

	eService availability	Degree of digitization (i.e. % of service delivery volume online)		
		2010	2013 (2015)	2016
eID/eSignature [65]	Yes			1,277,786 ”
Digital post [66]	Yes		(255,669)	294,689””
Tax declaration [67]	Yes	92%	92% (96%)	96%
Register for school [68]	Yes*			670.054
Register for university	Yes**			
Apply for student grant	Yes			
Change of address [66]	Yes		(75,719)	81,919
Housing subsidy	Yes#			
Apply for pension	Yes#			
Report vermin (FixMyStr)	No			
Report theft	No			

"N. of active cards. ""No. of redirections to other mail servers. All ID numbers have a digital post box on eesti.ee. *Depends on municipality. **Depends on university. #Multiple service types from different authorities, not all transactional eServices.

What is harder to assess is the actual volume of public service delivery online – or degree of digitization (i.e. % of service delivery volume online). Where available, the degree of digitization is included in Table 7.

Available data shows that the vast majority of Estonians have activated and use their eID and digital signatures, almost all tax returns are pre-filled and approved by citizens online, most children are registered for primary and secondary school online and that many change their addresses online too. By contrast to the successful introduction and high usage of eServices in some service areas, others such as social benefits and municipalities service are fragmented, not available as a transaction service online or not widely used [49, 53, 54, 56, 62]. Similarly, both citizens and authorities seem unaware of the potential efficiency by sending messages digitally via the joint-governmental digital post infrastructure provided by www.eesti.ee.

Considering the limited data availability for eService use, statistics for the proportion of citizens use of online banking (eBanking), shop online (eCommerce) and their level of online interaction with public authorities is a useful substitute and presented in Table 8.

Table 8. Citizens use of eBanking, eCommerce and interaction with public authorities online (at least once per year) 2010-2015, selected years (EU28 country average in brackets) [43]

	2010	2013	2016
Online banking	65% (36%)	72% (42%)	79% (49%)
Online commerce	17% (40%)	23% (47%)	56% (55%)
Interacted with government online	50% (41%)	48% (41%)	77% (48%)
Obtained info. from a gov. website	49% (37%)	45% (37%)	66% (42%)
Downloaded a form (for submission)	39% (26%)	30% (25%)	41% (29%)
Submitted a complete form (eService)	38% (21%)	30% (21%)	68% (28%)

Despite the fragmented online service offers (depending on the service areas), the data in Table 8 highlights that the Estonian usage of both private and public sector eServices are higher than the EU28 average on all parameters – and over time. With the exception of eCommerce, the use of eBanking and various forms of online interaction with public authorities are all between 12 and 40%-points higher in Estonia than the EU28 average in 2016. An interesting aspect is the percentage of Estonians using the internet (85%) in 2016. This is close to the number of citizens actively using eBanking (79%), citizens who interact with government online (79%) or use transactional eService's (68%) – a stark contrast to the EU28 average but which mirrors the patterns of other successful eGovernment service providers like Denmark and the Netherlands [39, 41, 43, 57]

6. DISCUSSION AND CONCLUSIONS

While Estonians household propensity to purchase of internet and citizens general use of the internet in Estonia (see Table 2) is similar to the EU28 average, the use of online banking services – which by concept are comparable to those of the government – is by comparison vastly higher in Estonia then for the EU28 average (see Table 8). This points to a number of influences related to eGovernance and inter-governmental cooperation.

Public awareness and channel strategies for public service delivery are directly related to eService take-up but seem to be influenced, both positively and negatively, by the eGovernance model, the level of cooperation and, the coordination between authorities in Estonia. First, the single national portal (www.eesti.ee) was launched in 2003, but the decision to channel users to a central portal is diluted by the launch of the rural municipality portal (www.kovtp.ee) in February 2011. The initial impact of cooperation on a single one-stop shop is thus eroded by a decision to deploy a second portal focusing on rural municipalities with no links to city municipalities or the national portal. Second, in the 3 years the author has been living in Tallinn, only a welcome letter has been sent to the eesti.ee mailbox which all Estonian ID numbers are born with. This indicating that authorities are not taking advantage of the portal and key infrastructure components which have the potential of creating a critical mass and usage of government online service offers akin to eBanking or has seen in the Danish eGovernment strategy 2012-2015 [39, 69, 70]. Third, while distributed responsibility is common in most countries, there seems to be a potential for further cooperation and compliance with the national eGovernment vision in Estonia. For instance, RISO is responsible for drafting and monitoring compliance with the national eGovernment vision, strategy and action plan, ITAO is responsible for service quality standard and the channel strategy choices, while RIA is running the national portal (www.eesti.ee) – and thus the most appropriate organization to ensure compliance with e.g. eService, single-sign-on, data and privacy standards. Similarly, the lack of letters, receipts and reminders sent to the national mailbox from authorities responsible for tax, pension, social services etc. points to a need for a more consolidated and joint-governmental approach to channel choices, online service delivery and re-use of key infrastructure components.

Roles, responsibilities and mandates are at times ambiguous in the Estonian approach to eGovernance and inter-governmental cooperation. For instance, who does the vision-network report to and which authority ensures that the network is consulted? On the strategic level, how proactive can MKM/RISO or the Government CIO and CIO network be visa-a-vis the ISC and the MKK/RISO, respectively?

With MKM/RISO being the responsible authority on the operational level, how strong is the mandate vis-a-vis the implementing thematic work groups and networks? Can the thematic work groups and networks side-step MKM/RISO by going directly to the government CIO or even the ISC or the cabinet office? Similar overlaps exist in relation to the thematic work groups and networks, as the government cabinet, the ISC and MKM/RISO all have the mandate to establish such daily implementation organs. While the CIO network represents a practical forum for decision making and problem solving in relation to daily implementation, its links to RISO and the ISC is fuzzy. This type of fragmentation is also exemplified in the existence of the Association of Estonian Cities and the Association of Municipalities in Estonia, both representing local authorities, albeit with different members.

It is clear that eGovernment and online service supply and use has been a success in the Estonian context. Pre-conditions like internet availability and the digital skills of citizens are in place. eServices,

one-stop portals and key enablers, such as eID and digital signatures, have developed and rolled out in line with national strategic objectives, eGovernment strategies, and action plans. Citizens use of eServices is positive but following a slow start.

The success has been based on a tradition of politically driven and motivated public sector modernisation, a consensus seeking approach, trust between actors, informal networks and cooperation with the private sector [49-51, 54, 62].

That said, the degree of cooperation between authorities and the level of integration between entities in the provision and production of services vary. Initial successes, such as the launch of eID and digital signatures (in cooperation with the private sector), and online tax applications provide new evidence in support of the positive role of inter-governmental cooperation play in the introduction and take-up of eService – as proposed by authors such as Heeks [5, 26], Lee & Kwak [32] Chen & Mingins [71].

Similarly, the less than optimal use joint infrastructure like the www.eesti.ee portal and digital postbox are an example of how benefit realization and value creation of ICT investments may not be maximized if authorities do not comply with, or support, key strategic objectives. Thus, the Estonian case highlights the importance of good management and coordination of government eGovernment activities in support of authors such as Davison [27], Iribarren et. al. [8], Janowski [28], Kalambokis et. al. [29], Shareef et. al. [30], Waseda [31] and organizations such as the OECD [72].

In conclusion, *the Estonian case supports the initial question asked i.e. that that is a positive relationship between a strong cooperative eGovernance model (cause) and the introduction of online services (effect 1) and subsequent citizen use of the online service delivery channel (effect 2)*. That said, the Estonian experience also highlights the importance of a formal eGovernance model with clear and recognized mandates to ensure that decisions are made, conflicts are resolved, and the strategic visions, objectives and outcomes are achieved. For instance, the existence of a national CIO or specialized government entity for eGovernment does not guarantee success. The Estonian case shows the positive impact of informal and personal networks and the role of individuals in driving a vision, ensuring coordination and inter-governmental cooperation, but this also illustrates the potential risk of confusion and failure if there are overlapping or conflicting responsibilities and mandates in place. While successful, the Estonian approach to eGovernance and inter-governmental cooperation would benefit from a streamlining of potentially overlapping mandates and the formalisation of informal networks. This will help minimize the risk of failure if consensus cannot be reached, if personal and institutional capacities and contacts does not exist (or fail), e.g. in relation to social benefits and services, to authorities' compliance with strategic decisions, the use of joint infrastructure, but also current strategic focus areas such as data re-use, artificial intelligence, eService usability, and eParticipation.

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Article VIII

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Georgia on My Mind: A Study of the Role of Governance and Cooperation in Online Service Delivery in the Caucasus

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Abstract. Georgia's achievements in public sector modernisation have been lauded, since 2004, for their ability to increase transparency, fight corruption, ease the way of doing business and improve public service delivery to citizens. Information Communication Technology (ICT) played an important role as an enabler of public sector reform. Despite this, research into the Georgian model of governance and inter-governmental cooperation is extremely limited. Similarly, literature reviews have, in recent years, pointed out limitations in the understanding of technology use in public service delivery and, particularly, the role governance, cross-governmental decision making, and cooperation play when introducing ICT solutions and online services to citizens. As part of a larger qualitative, multi-country comparison, this article analyses the Georgian approach to electronic governance (eGovernance). The analysis highlights the influence of politically motivated and driven public sector reforms underpinned by ICT use for better service delivery, transparency and a fight against corruption in the period 2004–2012. Despite early success in relation to ICT infrastructure, standards and roll-out to key enablers, the article finds that the electronic government (eGovernment) eco-system is fragmented and that the use of public and private online service (eService) is limited, despite high internet penetration and usage. The key barrier found is the lack of an effective governance and inter-governmental cooperation model to improve cooperation between government actors (e.g. data collection, quality and reuse, shared infrastructure, systems and service), build on existing infrastructure and enablers to optimize the value-added of earlier investments – particularly in relation to electronic identity management (eID), digital signatures (eSignature) and eServices. Georgia would benefit from a more formalized approach to ICT related programmes and projects by considering an IT-implementation model to effectively manage risk, improve benefit realization and link individual key performance measurements (KPI) to those of the eGovernment strategy and action plan.

Keywords: eGovernance · eGovernment · eService · Use · Inter-governmental corporation · Analysis · Georgia

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1 Introduction

Googling Georgia two things are guaranteed: first, confusion between the European Republic of Georgia or the southern US state of Georgia, and second, the post-Rose Revolution wave of successful public sector improving transparency, fighting corruption and providing a more effective service delivery. The question remains: what has allowed a small, low income country in the Caucasus region to seemingly succeed where others have not and is the answer to the apparent success found in the governance model and level of inter-governmental corporation?

Multiple research disciplines have analysed the public sectors IT and technology use. Academics in public administration (PA) [1–6], information systems (IS) management [2, 3, 7–10], or electronic government and governance (eGovernment and eGovernance) [11–16], have all highlight the failures of the public sector to apply Information Communication Technology (ICT) with real success. Often cited mistakes include blindly digitising current processes [13, 16, 17] and focusing on technology and supply [18–20] rather than value-adding outcome and impact of IT and technology [4, 21, 22] – not only in relation to ICT use in public administration but in particular when it comes to the provision of online services (eService) for citizens [20, 23].

To address multiple models for assessment have been proposed. The so-called stage and maturity models have been a key tool of academics, consultants and international organisations in assessing the relatively success of eGovernment across countries since the 1990s. A major flaw of the models is non-the-less their focus on supply, technology and organisational issues but with a rather limited understanding of public service delivery, especially if enabled by ICT [8, 20, 23, 24]. In addition, multiple authors – including the 2016 review of maturity models, public sector reform, IT governance, eGovernment literature by Meyerhoff Nielsen [23] – finds that current research does not adequately addresses the role of governance and cooperation in ensuring the successful supply and use of online eService's. In fact, front-office service provision and back-office integration are mixed-up in the majority of maturity models. For example, one-stop shop portals do not constitute a form of transaction, but are rather an indicator of the degree with which authorities cooperate and integration in the production and provision of services via a joint portal [20, 23]. While Heeks tries to address this by proposing a two-dimensional matrix model distinguishing between the front- and the back-office [25], the proposed model does not account for eGovernance or take-up [26].

Similarly, none of the analysed maturity models addresses governance directly [23, 26]. Davison [27], Iribarren et al. [8], Janowski [28], Kalambokis et al. [29], Shareef et al. [30] and Waseda [31] models highlight management and coordination issues, such as the existence of chief information officers (CIO). Cooperation, on the other hand, is indirectly addressed in most models. This is expressed in terms of vertical and horizontal integration, the sharing of information and data between public authorities (even the private and third sector), and the existence of one-stop shops [26, 32, 33], but again there is limited focus on the role of governance in proposing a national vision and strategy, let alone in ensuring the required cooperation between actors or ensuring the realization of the envisioned effects.

To investigate the role of governance and inter-governmental cooperation in the successful supply and citizen use of eService's, this article analyses the Georgian use of ICT in public administration and eGovernment. The aim is two-fold: *to identify the Georgian features and lessons learned in relation to the role of eGovernance and inter-governmental cooperation and to add the Georgian lessons to a future cross-country comparison.*

To address the stated aim, this article starts by outlining the methodology used (Sect. 2). The Georgian experience is presented using the conceptual framework, including background indictors and preconditions (Sect. 3), before the national approach to governance, cooperation model and eGovernment is outlined (Sect. 4). Key enablers and services supplied and their use (Sect. 5) is presented before observations and conclusions are presented (Sect. 6).

2 Methods

As part of a larger study address the research gaps in relation to eGovernment governance and cross-governmental cooperation identified by Meyerhoff Nielsen [23], a classical exploratory, qualitative, case study methodology framework [34–36] is applied to enable a with-in case analysis.

An adapted version of Krimmer's context, content, process model (CCP model) [28] as used by Meyerhoff Nielsen for the Estonian [37], Faroese [38] and Danish cases [39], a Danish-Japanese [40] plus a Estonian-Georgian comparison [41] is chosen to allow for future cross-country comparison. The conceptual model consists of four macro-dimensions: Background indictors; national governance and cooperation model; national approach to eGovernment; and effect measurements and preconditions. Each dimension explains a key area that influences processes, choices and outcomes in relation to eService supply and take-up. Using the framework for the with-in case analysis to identify the governance mechanisms in play will allow the author to make a cross-case comparison to determine the correlation (i.e., the more of Y, the more X) between a strong cooperative governance model (cause) and the introduction of online services (effect 1) and subsequent citizen use of the online service delivery channel (effect 2).

Using the framework, this article identifies Georgia's respective strengths and weaknesses in relation to the country's respective governance models and eGovernment experiences since 1991, but with a particular focus on the period since 2010. Georgia has been chosen for two main reasons: it is a rarely studied but potentially interesting case representing a small, low income, centralised country [34, 36, 42]. This allows the author to later compare Georgia to a high-income centralised micro-state like the Faroe Islands, a medium-income and centralized country of similar size like Estonia, a more populated, high-income, decentralised country like Denmark and a large, highly decentralized, high-income country such as Japan. Georgia, similarly, offers a chance to look at the role of governance and intergovernmental cooperation in a different socio-economic context and helps the author isolate the role they play in the supply and take-up of citizen online services.

Primary sources used include relevant academic literature, relevant policy documents, national and international statistical sources e.g. International Telecommunications Union (ITU) [43] and UNDESA's eGovernment Readiness Index [44–46]. The written sources are complimented with a small number of interviews carried out in May 2015 and February 2017.

3 Results

As a result of history and culture, countries operate in different contexts and offer different perspectives and experience when it comes to eGovernment and online service provision for citizens. Similarly, population size, income levels, administrative systems, and complexity vary. It is therefore important to put things in context.

3.1 Socio-economic Background

Georgia is, in socio-economic terms, a small but relatively populated country. Georgia is a small economy with a large trade deficit, but good GDP growth following a period of stagnation from 2008 until about 2014. The country is considered a nation state but with strong regional identities. The country, despite immigration, experiences population growth due to increased birth-rates [47, 48]. For details see key statistics in Table 1.

Table 1. Key socio-economic statistics 2016 [47, 48]

Population (January 2016)	3,720,400
Territorial size	69.700 km^2
Population density	57.3 per km^2
Official languages	Georgian, Abkhazian (in Abkhazia)
Ethnic groups	Georgian 86.8%, Azeri 6.3%, Armenian 4.5%, other 2.3% (incl. Russian, Ossetian, Yazidis, Ukrainian, Kist, Greek)
Median age and life expectancy	38 and 74.4 years
Population growth	−0.05%
Urbanization	53.6%
GDP 2016 (est.)	€13.67 billion
GDP per capita 2016 (est.)	€5,025
GDP growth rate 2016 (est.)	3.4%
Unemployment 2016 (est.)	12.1%
Imports 2016 (est.)	€6.43 billion
Exports 2016 (est.)	€2.69 billion

4 Internet Access and Use

For online service delivery to succeed, internet access and a minimum level of digital literacy and competences are essential pre-conditions. As an indicator of digital literacy levels individuals actual use of the internet, online banking and shopping sites are used (eBanking and eCommerce respectively). To put Georgia in context, Table 2 includes the average for the EUs 28 member states.

Table 2. Individual and household access to, and use of the internet, 2010–2016, selected years (EU28 country average in brackets) [49]

	2010	2013	2016 [50]
Household internet access [51]	27% (70%)	82% (79%)	95% (86%)
Individual with mobile internet [52]	18.80%# (21%*)	42.74%# (24%)	63% (27%)
Individual using the internet (at least once a week)	– (65%)	45.5%** (72%)	90% (79%)

Authors estimation based on 0.70 million and 1.59 million transactions in 2010 and 2013 respectively.
* 2011 data. ** 2012 data

While data is available from the International Telecommunications Union (ITU), other and more recent and seemingly reliable (see discussion by Meyerhoff Nielsen [53]) data is available from other sources. Generally, the ITU data shows a more bleak picture of internet access and use in Georgia compared to e.g. the US Aid financed survey of 1,500 Georgians in 2016. While both sources show growth in household internet access, it is particularly impressive the fact that 90% of households in a low-income country like Georgia choose to pay for internet access. Combined with the high level of actual internet use, this confirms that the pre-conditions for introduction online government services and citizens actual use of them exist in Georgia.

5 eGovernment and Governance

Georgia has, since the November 2003 Rose Revolution, actively pursued public sector reform. In particular, the period of 2004 to 2014 saw a massive change. Political initiative and a willingness to transform the public sector had wide spread public support and has created a solid ICT and legal foundation. The strategic focus was on transparency, accountability, efficient and effective public service delivery [54–56]. The role of ICT in underpinning the strategic objectives is therefore helpful for understanding the Georgian context and eGovernment outcomes.

5.1 Strategic Focus Since 1991

The Georgian eGovernment focus can be divided in two main periods: fragmented and uncoordinated use of ICT in the period 2004–2014, followed by attempts to introduce a more formalized approach and coordinated approach from 2014, as outlined in Table 3.

Table 3. eGovernment in Georgia, 2004–2018 [54–57]

2004–2014 ICT use in the public section	While no national eGovernment strategy or action plan in the period was active, individual initiatives in line ministries were implemented. As part of a general drive for public sector reform, increased access to public services, transparency and an anti-corruption drive, ICT use was initially focused on the creation of basic information systems, digitalizing internal information resources, automating information flows, creating data centres, and connecting national authorities with their regional offices
2014–2018 Digital Georgia – eGovernment strategy and action plan	The first formal eGovernment strategy and action plan was approved in 2014 with the aim of making Georgia's public sector more efficient and effective, offering integrated, secure, and high quality eServices, improve usage and participation, and enabling ICT-driven sustainable economic growth
	Strategy focuses on 11 thematic directions (i.e. eService's, eParticipation and Open Government, eHealth, Public Finance Management System, eBusiness, making Georgia a regional ICT-Hub Georgia, infrastructure, cyber security; skills development and e Inclusion) grouped into service areas, future excellence, ICT enablers as well as horizontal measures such as enabling frameworks, governance and awareness. The strategy has success criteria and is underpinned by an action plan with associated KPIs
	The eGeorgia strategy is part of the Public Administration Reform Roadmap 2020 [58], which is an "umbrella" framework also including the Open Government Partnership, Anti-corruption, Public Finance Management System Reform, Regional Development, Civil Service Reform and eGovernment directions and action plans

While the first decade of eGovernment and ICT use was uncoordinated and without a comprehensive "whole-of-government" vision, the use of ICT in the political drive for the transformation of the public administration have reflected similar patterns seen in Europe, the former Soviet Union and beyond (albeit at different pace), that is: infrastructure roll-out, backend systems, launch of key enablers like eID and core registers, increased

access to public sector services, digital literacy and, subsequently on governance structures, standards, eService supply and use [40, 44–46, 53, 57, 59–62].

The introduction of the first actual eGovernment strategy and action plan has to date born little fruit. Despite extensive consultation of government stakeholders in 2012–2013, political approval and subsequent incorporation into the Public Administration Reform Roadmap 2020, funding has been limited and delayed [54–56, 63, 64]. A mid-term review consisting of three-days of stakeholder workshops facilitated by a team of international experts aimed to re-ignite the strategy and action plan. The result is a prioritisation of a number of building blocks in 2017–2018, in particular the reinforcement of effective enabling frameworks, such as the governance structure, enforcing eID management, increase back-office digitisation and the provision of more user-friendly eServices and ensure their actual use [54, 57, 64–66].

5.2 Governance Model and Institutional Framework

Georgia is in many ways a small and highly centralized country. The central government institutions are few and provide most public services for citizens. Nine regions exist but have limited public service responsibility. Of the 74 municipalities, only the four main urban centres Batumi, Kutaisi, Telavi and the capital, Tbilisi, have the financial and human resources to provide citizen orientated services in larger numbers. The government and public authorities are actively trying to change this through the Public Service Hall and Community Center concepts – providing back-end systems, access to relevant registers and skills development [54, 57, 64, 67, 68]. Table 4 summarizes the general approach to public service delivery in Georgia.

Table 4. General governance and institutional framework [69–71]

National institutional framework and governance	Mostly centralized, decisions are made and executed on high horizontal level. Multi-level management approach is not implemented yet. eGovernment and ICT related initiatives are concentrated within key public agencies. Local governance with low capacity to deliver eService's and use ICT with interactions with citizens and businesses. The development of local eGovernment infrastructure and provision of eServices to local population is centrally implemented by the Public Service Development Agency within the MoJ
Decentralisation of government authority	Limited, due to limited or lack of capacity in local governance level

Like governance in general, Georgia's approach to ICT reflects the country's context, experience and public sector capacities, including decision making processes, the degree of cooperation between authorities and different levels of government, the private sector, civil society, and the research community.

Politically, Georgia has seen three distinct political periods since gaining independence in the wake of the Soviet Union collapse. From 1991 to 2003 the newly

independent Georgia was dominated by the former elite, economic contraction and social upheaval, the Rose-Revolution 2003 against rampant corruption and inefficiency lead to a center-right reformist government lead by United National Movement (UNM), economic growth and a professionalization of the public administration. In the aftermath of the 2008 war, economic stagnation and increased dissatisfaction with the UNM government led the newly formed Georgian Dream party to win the 2012 Parliament elections and the 2013 Presidential elections. Since 2012, the economy has been slow to recover and at time showed a fragmented political focus. The post-2012 result has been a relatively small and professional public sector, but also resulted in deterioration of Georgia's positions government and eParticipation international rankings [44–46, 60, 72].

Historically, policies, strategies, action plans and institutionalized processes have often been fragmented or lacking. Focus has been on implementation of overall policy objectives rather than on formal processes, coherence of the overall ICT framework for the public sector or system documentations [54, 63, 73]. Georgian successes has initially been based on the political vision and willingness to reform the public sector, scrap old processes and legislation in favour of ICT systems, a more professional civil service – even firing 60,000 police officers to achieve the political vision of more efficient, effective, transparent and accountable government and service delivery [58, 74].

In relation to the eGovernance model, Georgia initially did not have a formalised structure focusing on ICT use in the public sector. The first attempt to formalise the institutional framework for eGovernment and ICT related intergovernmental cooperation emerged in 2007. The CIO Council was established and chaired by Prime Minister, the deputy chair was the MoJ and secretarial support by DEA – the mandated and regulatory authority for eGovernment. All relevant line-ministries and ICT related agencies were members of the CIO Council, as were key national ICT experts (incl. from the private sector and NGOs – and interestingly also from of US Aid). The CIO Council was responsible for the strategic direction and horizontal coordination, initiation and approving the eGovernment strategy, budgetary support, allocation of inter-agency support if required. The aim was to ensured cooperation and collaboration among key stakeholders. The MoJ constituted the mandated authority for eGovernment issues, with the actual implementation delegated to DEA. Authorities were generally responsible for ICT initiatives for their respective areas and service portfolios [54, 55, 57].

To increase the efficiency of inter-governmental cooperation in relation to ICT, CIO Council was replaced in 2014 with an eGovernment Unit based in the cabinet office [75]. In practice the change was never effectuated as the Unit had either limited or no staff. The subsequent vacuum has in effect allowed authorities to peruse their own agendas, set their own priorities and hampered the effective coordination of ICT in Georgia. This lack of inter-governmental coordination is a real barrier for enforcement of national standards for e.g. interoperability (IOP), reuse of data, usability requirements in eService's etc. It has also lead to lack of transparency of ICT project plans, objectives, budgets and activities. Ineffective, overlapping and redundant ICT investments is the result of the weakened governance model, as is unclear mandates, responsibilities and general lack of knowledge sharing and low exploitation of available skills [54, 65].

As a result, the 2016 mid-term of the 2014–2018 eGovernment strategy have recommended a new governance structure which is summarised in Table 5.

Table 5. eGovernment governance and cooperation actors and responsibilities [54, 65, 75, 76]

Responsible authority for eGovernment strategy	The eGovernment Development Unit (eGDU) within the Department of Political Analysis (DPA) of the Administration of Government (i.e. the cabinet office) is responsible for strategic planning, planning, horizontal and vertical coordination eGovernment When drafting strategies, stakeholders are consulted through both informal meetings, public hearings and debates. Georgia tends to use international experts or international organizations (e.g. EU, OECD, UN) for expert opinions on the draft strategy documents On both strategic and operational levels, the Legal Entity of Public Law in the MoJs DEA is a key supporting authority for the cabinet office and leads and organizes the strategy drafting and consultative process. In practice, the DEA is the liaison body for public and private organization, collects input, organizes stakeholder meetings, workshops with external partners (including international organizations and foreign experts), draft position papers and preparing briefs
Responsible authority for action plan	On the strategic and operational levels, the DEA is responsible for the oversight, coordination and monitoring of all eGovernment initiatives in the national action plan. The DEA provides the status updates and associated recommendations to the eGDU and the cabinet office, while the cabinet office has the final say in any decisions, including in cases of diverting opinions, disagreements or a lack of compliance with the eGovernment strategy and action plan objectives The DEA is supported by thematic work groups of line ministries and stakeholder forums. The thematic work groups are formed to coordinate individual action plan initiatives and meet almost monthly
Responsible authority for initiating and coordinating new eGovernment strategies and action plans	The DEA is responsible and mandated to initiate and coordinate eGovernment strategies and action plans with active involvement of all stakeholders. The DEA is guided by the cabinet office and eGDU vision and input from relevant authorities

(*continued*)

Table 5. (*continued*)

Chairperson organization	The Prime Minister chairs both the cabinet and the eGDU
Hosting organization and secretariat	eGDU is part of the cabinet office but supported by the mandated MoJ and the specialized agency DEA
Member organizations	Members of the eGDU are the DPA (housing the eGDU), DEA, ministry and agency CIOs, different eGovernment Legal Entities of Public Law, the National Regulatory Authority, the Georgian IT Innovation Center, NGOs and other civil society watchdogs like Transparency International and sometimes donor organizations (US AID, UNDP, EU, etc.)
National governance and cooperation model	The national coordination and collaboration mechanism is not fully implemented and therefore not reinforced. Many aspects of eGDU and DEA are currently duplicated
Process of eGovernment strategy and action plan development and approval (from idea to approval by government)	Centralized, initiated and coordinated by the DEA, but hybrid as MoJ/DEA is responsible to the cabinet office and DPA which provides the vision and strategic direction, and to which issues can also be escalated eGovernment strategies are initiated and drafted by the DEA, based on the direction given by the DPA, and in consultation with relevant stakeholders. Prior to finalization, the DPA ensures that strategy, action plan and their success criteria and KPIs reflects a "whole-of-government" approach, that all relevant stakeholders were consulted and is aligned with the general national strategic development framework, vision and strategic objectives The DPA may solicit additional external experts or organizations (domestic and international) for input and adjust the DEA provided draft. The aim is to ensure ownership domestically, limit resistance to the strategic direction and initiatives as well as align the eGovernment strategy with international best practice and development in EU member states. The DPA is responsible for submitting the final strategy and action plan to the cabinet office for government

(*continued*)

Table 5. (*continued*)

	approval and executing the strategy through decree
eGovernment strategy legality	Yes, the eGovernment strategy is an integral part of Public Administration Strategy and Roadmap of Georgia which is approved by Prime Minister decree and is thus legally enforceable
Action plan (i.e. is the strategy underpinned by an action plan)	The process and responsibilities are the same as for the eGovernment strategy
Action plan legally binding	Yes, as part of the eGovenrnment strategy, the action plan is legally enforceable

As outlined in Table 5, the Georgian eGovernment model has a high level of complexity. It can nonetheless be boiled down to three layers: the strategic level, the operational level, and the daily implementation level.

At the strategic level, the eGDU ensures that all governance processes, strategic visions and long-term decisions are in line with the political agenda of the country and, at the same time, that high political will is properly translated into executive action plans. All horizontal eGovernment and ICT projects, new initiatives and new authorities are discussed, evaluated and approved by strategic level. The eGDU carries out its work based on input from the MoJs specialised agency DEA, which is the mandated body for ICT and eGovernment.

At the operational level, the execution and management of the eGovernment decisions made at strategic level is carried out by the mandated body DEA. The DEA provides support to the strategic level in the planning and implementation of the strategic priorities, monitors eGovernment activities and implements a number of key initiatives as well – in short, the DEA ensures the strategic alignment and coordination of eGovernment activities in the short, medium and long term.

Daily implementation has always been decentralized to responsible line-ministries and authorities, but from 2016 onwards a co-ordination mechanism in the form of thematic work groups has been introduced. Each thematic work group is responsible for the implementation of their respective action plan initiatives and report to DEA on progress, risks and for potential conflict resolution. The DEA, in turn, presents regular management overviews to the eGDU and the cabinet office, including the escalation of issues to be solved at cabinet level. The model is illustrated in Fig. 1 and further summarised in Table 6 below – where the strategic and tactical level is merged to allow for easier comparison with other case studies.

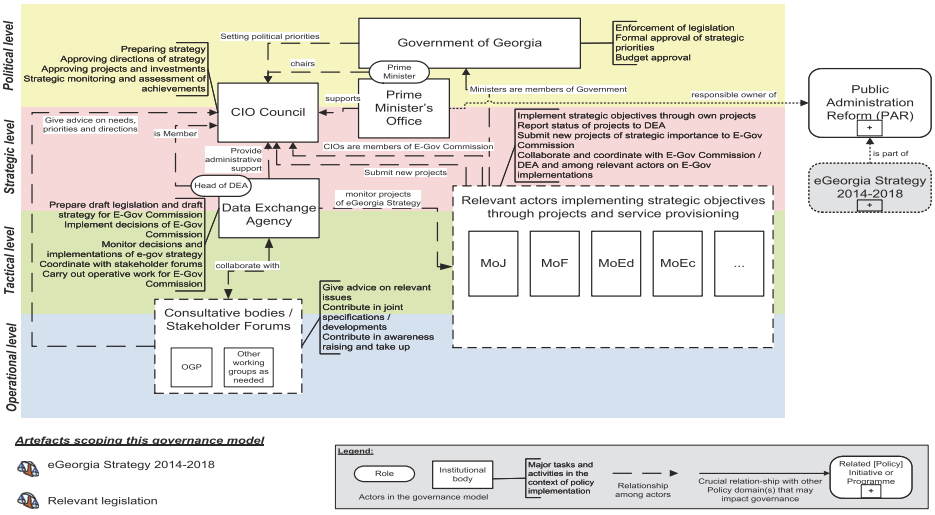

Fig. 1. eGovernance and coordination model [65]

Table 6. eGovernance and coordination model implemented in 2016–2017 [54, 65, 75, 76]

	Co-ordination of the implementation of strategy	Wider co-ordination of the development of information society
Vision		Administration of the Government of Georgia Civil society organizations
Strategy	Administration of the Government of Georgia DEA	
Implementation of action plans	DEA	DEA, Communication Regulatory Body
Daily implementation and everyday work	Individual Ministries and responsible field agencies	
	Thematic work groups/networks	

6 Key Enablers, Citizen eServices, Their Use and Impact

Having confirmed that the required infrastructure and digital literacy exist (Sect. 3), outlined the strategic eGovernment focus over time and described the governance and cooperation model (Sect. 4), what has Georgia achieved in terms of the roll-out (supply) of key enablers and citizen eservices and impact (i.e. demand and use)?

Due to the fragmented eco-system for ICT and public sector services online, it is not easy to get a full picture. Key enablers, such as electronic identities (eIDs), digital

signatures (eSignatures), core government registries (e.g. cadastral, property, population, business, vehicle registries), most national authorities have websites with information, a national Government Gateway is in place for data distribution and re-use, as is the www.opendata.ge portal, the statistical services www.geostat.ge and a national one-stop-portal www.my.gov.ge [56, 63, 77].

That said, the impact and value-added of the individual initiatives are hard to assess. The Government Gateway has seen a steady increase in the number of public and private authorities integrate to the centralized service bus – almost 70% from 23 organizations in 2014, 26 in 2015, to 39 in 2016 – but the value of annual transactions have fallen 20% from approximately 55 million in 2015 to circa 44 million in 2016 [78]. The number of datasets available on the open data portal have increased 82.5% from 263 datasets in 2015 and 480 in 2016 [78]. By comparison, www.my.gov.ge only has 56 eServices available and the number of users is low, as highlighted in Table 7, and most users looked for information rather than transactional eServices. For instance, in 2016, 35% looked for information related to legal acts and public hearings, 18% looked for tax relation information, 17% visited the property registry, 16% looked for information related to border crossings, and 14% searched the vehicle registry for data [78].

Table 7. my.gov.ge use 2012–2016, selected years [78]

	2012	2013	2014	2015	2016
Registered users			7,740	4,650	40,026
Number of services	1,319	21,082	52,343	46,652	69,665
Repeat use per user*	–	–	6,76	10,03	1,74
% of population*	–	–	0,21	0,12	1,08

* Author's estimation.

The existence of eID/eSignature, digital post box solutions and a few select number of citizen service areas are confirmed in Table 8. What is harder to assess is the actual volume of public service delivery online – or degree of digitization (i.e. % of service delivery volume online). Where available the degree of digitization is included in Table 8.

Available data shows a mixed picture. A relatively large number of Georgians have an eID/eSignature enabled ID card and almost all tax returns are submitted online. There is only limited use of FixMyStreet type solutions. By contrast to the successful introduction online tax forms and the enabling eID and eSignature most high-volume/high-frequency service areas such as social benefits, registering a new address, daycare, schools, universities are not available as eServices despite the existence of the required registries, good quality data and the document and data exchange infrastructure. Similarly, both citizens and authorities seem unaware of the potential efficiency of integrating services on the national portal or sending messages digitally via the joint-governmental digital post infrastructure provided by www.my.gov.ge.

Table 8. Individual use of the internet 2014–2016, selected years

	eService availability	Degree of digitization (i.e. % of service delivery volume online)		
		2010	2013	2016
eID/eSignature [50]	Yes		48.3% (2015)*	62,7%
Digital post [78]	Yes		584 (2015)	1,869
Tax declaration [50, 79]**	Yes	c. 35%	96%	96%
Register for school	No			
Register for university	No			
Apply for student grant	No			
Change of address	No			
Housing subsidy	No			
Apply for pension	No			
Report vermin (FixMyStreet) [80]	Yes		400 reports	51 reports
Report theft	No			

* Author's estimation based on 2015 volume of 1,800,000.
** Author's estimation based on volume in 2010 of 678,770 electronic declarations, in 2013 of 2,526,004, in 2015 of 2,784,186 and in 2016 of 2,627,850.

Considering the limited data availability for eService use, statistics for the proportion of citizens use of online banking (eBanking), shop online (eCommerce) and their level of online interaction with public authorities is a useful substitute. Unfortunately, data is only available for 2016 and presented in Table 9.

Table 9. Citizens use of eBanking, eCommerce and interaction with public authorities online (at least once per year) 2010–2016, selected years (EU28 country average in brackets) [49, 50]

	2010	2013	2016*
Online banking	– (36%)	– (42%)	21% (49%)
Online commerce	– (40%)	– (47%)	14.6% (55%)
Interacted with government online	– (41%)	– (41%)	– (48%)
Obtained info. from a gov. website	– (37%)	– (37%)	28.7% (42%)
Downloaded a form (for submission)	– (26%)	– (25%)	9% (29%)
Submitted a complete form (eService)	– (21%)	– (21%)	9.3% (28%)

* Georgian data is comparable to EuroStat data as it follows the same data collection methodology, although collected by US Aid funded national survey "Georgia Good Governance Initiative: E-Readiness Study in Georgia".

Despite the fragmented online service offers (depending on the service areas), the data in Table 9 highlights that the Georgians do use both private and public sector eServices, albeit at a far lower level than their general use of the internet – and most likely consisting of social media and online entertainment. While general internet access

and use is higher than the EU28 average (see Table 2), Georgian use of eBanking, eCommerce and eGovernment services are all substantially lower (see Table 9). An interesting "Georgian dilemma" as actual use and households propensity to purchase internet for home use is on par with the most wired countries in the world, including other successful eGovernment service providers like Denmark, the Netherlands, and Estonia [39, 40, 49, 53].

7 Observations and Conclusions

Backoffice ICT use in Georgia has been a success, as has the introduction of key enablers, relevant registers and standards. Similarly, a number of high-volume, high-frequency online services are available. The areas of open data, data reuse in government and eParticipation can be improved, but show some initial promise - particularly in relation to the open data portal. Georgia faces a number of recurrent challenges, including: limited budget availability; a shortage or underutilization of qualified staff; expensive infrastructure; a lack of some key national standards; data compatibility; and security issues [64]. These challenges are amplified by the vacuum left by an inefficient or missing governance structures to ensure cross-governmental cooperation and joint-development, and has led to a fragmented ICT framework [55, 63, 65, 66, 72].

While Georgians household propensity to purchase internet access and citizens general use of the internet is higher than the EU28 average (see Table 2), the use of banking, commerce and government online service offers is by comparison all substantially lower (see Tables 2, 7–9). Despite the success in rolling-out the required internet infrastructure, the limited use of government eServices points to the influence of two inter-connected factors:

- While key enablers like eID and eSignatures are already rolled-out and available through the national ID card, actual use is limited. Online services need to be used to add value to the user and provide the envisaged return on investment, but this requires a coordinated and joint-governmental approach to usability and channel strategies, which are still lacking. Georgian authorities therefore need to increase their corporation to ensure that the national my.gov.ge portal contains all government eServices, no matter the responsible authority, that single-sign-on is implemented and that there is a common look-and-feel across different service delivery areas.
- The lack of eID/eSignature use, limited public awareness of online service offers and the value of using them, a lack for channel strategies and promotion of public sector eService – maybe even a lack of trust in online transactions involving payment and personal data. The limited public awareness and lack of channel strategies seem to be influenced by issues related to governance and inter-governmental cooperation.

While distributed responsibility is a common feature in most countries, Georgia currently does not have a fully functioning mechanise to ensure cooperation and compliance with the national eGovernment vision, established mandates and standards.

Similarly, there is currently no actual mechanism to ensure adequate funding of ICT projects, bind to together fragmented initiatives or to ensure compliance with established mandates, standards etc. This points to the importance of cooperation between authorities and the level of integration between entities in the provision and production of services, as proposed by authors such as Heeks [5, 25], Lee and Kwak [32] Chen and Mingins [33]. The Georgian case therefore provides additional evidence in support of the positive role inter-governmental cooperation plays in the introduction and take-up of eService. In the Georgian context, the vacuum left by an un- or understaffed eGDU, and an unclear mandate for the DEA to take on this responsibility, is partly to blame for the current stagnation in relation to eGovernment and online service use.

The eGovernance model currently being implemented may be complicated on paper but could in theory be a solution – although it is worth simplifying it. In fact, many aspects of the eGDU and the DEA seem to be duplicated, which results in misunderstanding amongst stakeholders, resistance to comply with mandatory requirements specified in the joint-governmental policies and strategies – not least the eGovernment strategy and action plan. While strategic initiatives are in the process of improving local government capacities and their user of ICT, municipalities are remarkably absence in past, present and future eGovernment governance and inter-governmental cooperation models which are still largely planned vertically with national line ministries and agencies.

Similarly, the less than optimal use of joint infrastructures like the www.mygov.ge portal and eID/eSignature are examples of how benefit realization and value creation of ICT investments is not maximized due to authorities incompliance or limited support for key strategic objectives. Thus, the Georgian case highlights the importance of good management and coordination of government eGovernment activities in support of authors such as Davison [27], Iribarren et al. [8], Janowski [28], Kalambokis et al. [29], Shareef et al. [30], Waseda [31] and organizations such as the OECD [81].

In conclusion, *the Georgian case adds support to the initial question asked i.e. that there is a positive relationship between a strong cooperative eGovernance model (cause) and the introduction of online services (effect 1) and subsequent citizen use of the online service delivery channel (effect 2).* The Georgian experience highlights the importance of a formal governance model for ICT use. A governance model with clear and recognized mandates to ensure that decisions are made, conflicts are resolved, and the strategic visions, objectives and outcomes are achieved. While the existence of a national CIO (like the eGDU) or specialized government entity for eGovernment (like the DEA) does not guarantee success, the current vacuum in Georgia is a clear example of what often happens when a mechanism to ensure compliance with a strategic vision, decision making and conflict resolution is missing. The positive impact of informal and personal networks and the role of individuals in driving a vision, ensuring coordination and inter-governmental cooperation can play also emerge in the Georgia case, but with limited results. While having at least a partial mandate, the DEA staff has not been able to fully convince line ministries of the need for cooperation rather than launching overlapping or conflicting initiatives. While initially successful, the Georgian approach to eGovernance and inter-governmental cooperation would benefit from a streamlining of potentially overlapping mandates and the formalisation of informal networks.

This will help minimize the risk of failure if consensus cannot be reached and if personal and institutional capacities or contacts do not exist (or fail).

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Education

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1991–1994	Niels Brock Copenhagen Business College, Højere Handelseksamen (Higher Commercial A-levels)

Language competence

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Professional employment

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2003–2007	European Institute of Public Administration, researcher and project manager
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Taani keel	sorav (sh. keskmisel tasemel norra ja rootsi keele oskus)
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