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Digital Transformation of Public Administration Services in Denmark: A Process Tracing Case Study

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Abstract

This paper presents the results of a process tracing study of digital transformation in Denmark. The study is part of a European Horizon 2020 project entitled Co-Val (Understanding value co-creation in public services for transforming European public administrations). The paper traces the development of policies and stakeholders involvement that have contributed to achieving the digital transformation in Denmark's public administration as it is reflected by the current DESI index over the last two decades [1]. The study uses a qualitative methodology in the form of case study [2]. In particular, a longitudinal case study and process tracing methodology is used. The data are secondary data consisting of digital transformation strategies, policies and related documents and press releases retrieved on governmental websites. The case study provides an overview of Denmark's digitalization position in relation to the rest of EU, the basic digital policies and strategies that the Danish government has undertaken over the last two decades as well as an account of the key stakeholders involved in such a process. The case study is important because it sheds light on the digital transformation process in the most advanced country according to the DESI Index and therefore it presents some lessons other countries might learn from.

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Keywords: Digital transformation, e-government, process tracing, Public administration services, digitalization, ICT.

1 Introduction

Denmark has been the leading European and world country regarding digitalization of public services for the last several years [1, 3]. Denmark has a long tradition of ICT governance and policy making to promote Internet in the society. Several studies have investigated the development of the information society, network society and e-commerce adoption in Denmark from different points of view. For example, Andersen and Bjorn-Andersen (2001) [4] analyzed the Danish e-commerce strategy and e-commerce adoption and found that there was in 2001 a policy commitment from the Danish Government to utilize e-commerce for welfare purposes. E-commerce had to be used to further develop the current welfare society model for a better quality of life; to reach new scientific achievements; better public service; improved healthcare; more exciting jobs; more interesting cultural offerings; and a less stressed workforce with more time for individual development. In addition, Andersen et al. (2003) point out that the Danish e-commerce strategy is a highly ambitious effort to become the world's leading IT nation [5]. Instead of a production-led strategy aimed at stimulating domestic hardware and software production, Denmark pursued a demand-oriented approach focused on promoting the widespread adoption of e-commerce in the Danish society. In the article, Andersen et al. (2003) analyzed the Danish national environment for e-commerce, discussed four sets of governance initiatives aimed at the development of e-commerce, and analyzed the reasons for its success in B2B and relative failure in B-to-C e-commerce [5]. However, most of the studies addressing Danish e-government policy have been published in the last decade and address mostly e-commerce adoption and diffusion in a B-to-B and B-to-C context. Therefore, besides being a bit old, previous studies do not provide a comprehensive overview of the events and actors that have led to Denmark having a leading position concerning digital transformation and especially the digital transformation of public administration. In order to fill this gap, this study investigates the following research question: What factors (policies, processes, activities and stakeholders) have contributed to achieving the digital transformation in Danish public administration as reflected by the current DESI index? To answer the research question an in depth case study based on process tracing methodology is conducted by using

key governmental documents and reports [6, 7]. In the process tracing the focus is on the following factors: situational mechanisms such as political and demographic structure and action formation and transformation mechanisms such as digital policies. This study is part of a European Horizon 2020 project entitled Co-Val (Understanding value co-creation in public services for transforming European public administrations) (<http://www.co-val.eu/>) and more precisely presents some results relative to the Danish context concerning digital transformation of public administration in Europe (WP3). Please refer to Mergel et al. (2018) for the whole report about policy tracing of digital transformation of European public administration [6, 7].

The article is structured as follows. The following paragraph briefly presents the methodology. This is followed by the main case study results and a conclusion.

2 Research Method

In order to investigate the research question this study conducts a case study of Denmark. Case study is a useful method for investigating complex real-life phenomena based on rich data [2]. The chosen case is an ideal setting to collect the necessary data to investigate the factors such as policies and actors that have contributed to achieving the digital transformation in Danish public administration. In particular explanatory-outcome process tracing is used to investigate such factors [6, 7]. Process tracing is used to study the causal mechanisms in a single-case research design. Process tracing is especially suited to tracing the combination and interaction of divergent causal factors in the process that leads to an outcome [8–11]. By using explanatory-outcome process-tracing, the study aims to provide an explanation of the outcome of the case. The aim is to show the presence or absence of causal mechanisms that contributed to digital transformation of public administrations in Denmark. Specifically the study looked for situational mechanisms such as demographics and political structure and action formation and transformation mechanisms such as strategies, stakeholders involved in the digital transformation process and budgets. The data collection included official policy and strategy reports, press releases published on key Danish governmental web sites such as the Danish digitalization agency, the Ministry of Finance and Ministry of Industry, Business, and Financial Affairs and reports written by other international organizations such as OECD and European Commission.

3 The Danish Public Administration Case

3.1 Denmark and Digitalization

According to the Digital Economy and Society Index (DESI) report 2018, Denmark ranks first out of the 28 EU Member States and as Figure 1 shows it has done so for the last years [1]. The DESI Index tracks the progress of a country's digitization according to connectivity, human capital, use of internet services, integration of digital technology and digital public services. Denmark belongs to the high-performing cluster of countries and is a leader in digitization in the world. Denmark together with Sweden, Finland, and the Netherlands have the most advanced digital economies, followed by Luxembourg, Ireland, the UK, Belgium and Estonia. In 2018, Denmark made progress in most DESI dimensions, with the exception of Integration of Digital Technology.

According to DESI report 2018 Denmark performed very well in the connectivity dimension, also due to the widest 4G coverage in Europe, and the increase in coverage and take-up of fast and ultrafast fixed broadband connections in Denmark. In Denmark, broadband goals have been strongly linked to digitalization initiatives and are supported by a number of political initiatives both at central government, regional and municipality level aiming at nation-wide fixed and mobile broadband coverage.

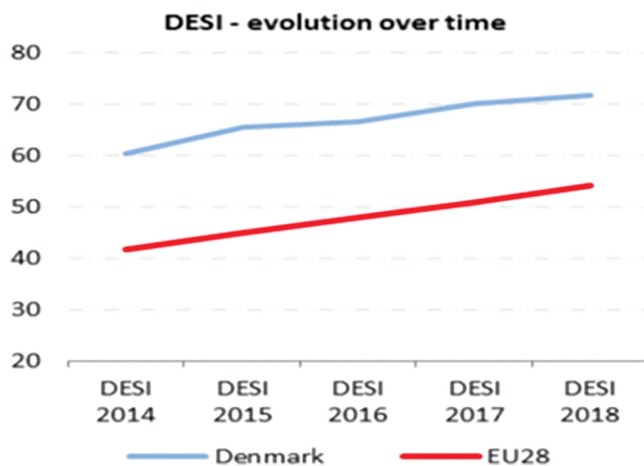


Figure 1 DESI evolution over time- Source: European Commission [1].

Concerning the “Human capital” dimension, a high percentage of Danes have at least basic digital skills as well as the percentage of ICT specialists is slowly increasing in the country. Denmark is performing very well and making progress in particular in its percentage of STEM – science, technology, engineering and math -graduates. As it can be seen in Figure 1 “DESI Evolution Over Time”, Denmark has performed above the average of the EU countries at least over the last 4 years [1].

Regarding “Use of Internet”, almost all Danes are online (95%) and are good users of a variety of online services, particularly for banking, shopping and accessing online entertainment. They are also heavy users of online video calls (62%) and social networks (78%). Denmark is leading the EU and the world rankings in the use of digital technologies by enterprises and in the delivery of online public services. For example, Denmark scores the highest (100 points) in availability of domestic and cross-border online public services for businesses and 86% of internet users that must submit forms use online services to do so.

In addition, Denmark leads the Integration of Digital Technology in the business dimension with 28% of SMEs selling online and a majority of Danish enterprises having embraced digital technologies well above EU average. About 10% of Danish SMEs sold cross-border in 2017 with a high percentage of their revenues coming from e-commerce (14.5%). A large number of Danish enterprises embraced digital technologies, such as cloud (38%) and social media (29%) and are highly using electronic information sharing technologies (40%).

However, some indicators show that there is still room for improvements. For example, more than a quarter of the Danish population still lacks basic digital skills. Furthermore Denmark needs to create a better match between the digital skills required by companies and the supply of graduates with these skills. According to the latest EDPR report [12], Denmark, in fact, still lacks an overall strategy for digital skills as digital skills initiatives have mainly been associated to individual policies. Addressing the availability of ICT specialists is important for supporting the digital and innovative transformation of the Danish economy. The rest of the paper explains the factors that have been at the basis for such Danish digital transformation and DESI index ranking.

3.2 Situational Mechanisms – Political and Demographic Structure

3.2.1 Political structure

Denmark is a constitutional parliamentary monarchy with legislative power held by a unicameral parliament (Folketing) [13, 14]. The Danish Constitution dates back to 1849, with the latest and most comprehensive amendments dating to 1953. Denmark became a member of the European Union on 1 January 1973. The Danish Parliament has 179 members, elected for a four-year term. 135 seats are allocated on a constituency basis in the 17 multi-member constituencies; the remaining seats are divided nationally and reallocated to constituencies. Greenland and the Faeroe Islands, belonging to the Danish realm, have two Members of Parliament each. Parliamentary elections should be held every four years. However, they are often held before the completion of the four-year terms, either because of ‘vote of no confidence’ to the Government, or because the Prime Minister calls for an election to improve the ruling coalition’s parliamentary position.

Since January 1972 The Head of the Danish State is Queen Margrethe II, while the actual Head of Government is Prime Minister Lars Løkke Rasmussen (since June 2015). The Government, headed by the Prime Minister holds the executive power, while The Monarch, Queen Margrethe II, appoints the Prime Minister based on recommendations from the leaders of the political parties. On 1 January 2007, Denmark has undertaken an important structural reform of the local government, by decreasing the number of regions to 5 and the number of municipalities to 98. The reform has resulted both in further decentralization of tasks from the regional level to the municipal level as well as re-centralization of certain tasks to the State level. The 98 new municipalities are responsible for handling most tasks related to citizen service delivery. The five new regions are responsible for hospital care and health insurance, some elements of social affairs, regional development and coordination with business, tourism, transport and environment.

3.2.2 Demographic structure

According to the Danish Statistics Office (Statistics Denmark, 2018), Denmark has a population of 5.8 million inhabitants of which 1.6 million – or almost 30 per cent – live alone. The official EU language is Danish and the Currency is Danish Crown (DKK). The Capital city is Copenhagen. The average life

expectancy is 79.0 years for men, and 82.9 years for women. The Danish population has grown in recent years due to immigrants outnumbering emigrants, and births outnumbering deaths.

The share of persons aged 25 to 64 years with long-cycle education has grown from 6 per cent in 2000 to 12 per cent in 2018. In the same period, the share of the population with basic school as their highest level of completed education has dropped from 30 per cent to 19 per cent. The unemployment rate was 6.0 per cent for women and 5.7 per cent for men in 2017. The unemployment was lowest among the 45–64-year-olds (3.7 per cent) and highest among the 15–24-year-olds (12.0 per cent).

Denmark had a significant surplus on the balance of payments of 7.3 per cent of GDP in 2016 due to exports exceeding imports. Denmark has a GDP per inhabitant in PPS (Purchasing Power Standard EU 28 = 100) equal to 124 (2016). In addition, according to Danish Statistics Office [15], Denmark has a large return on net foreign assets, GDP growth rate of 2.2% (2017) and an Inflation rate of 1.1% (2017). General government gross debt (Percentage of GDP) was 36.4, while the General government deficit/surplus (Percentage of GDP) was 1.0% in 2017. The biggest trading partner is Germany followed by Sweden. Concerning digitalization level, according to Eurostat (2018) about 93% of all Danish Households and 100% of all enterprises have access to Internet in Denmark. Percentage of individuals using the internet for interacting with and obtaining electronic information from public authorities in Denmark is about 90%, while 92% of all individuals access Internet more than once a week.

3.3 Action Formation and Transformation Mechanisms-Strategies, Stakeholders and Budgets

3.3.1 Governmental strategies for digital transformation

Denmark has a long tradition of using IT in public administration and many initiatives go back to the 1990s and even to the 70s [16]. In order to make an analysis of the Danish Government strategies evolution over the last 2 decades, the focus is here on the visions, the main pillars/objectives that they are based on and a few key projects (Table 1). Please refer to the original strategies for a very detailed description of all the initiatives set forth by each strategy.

Table 1 Summary of strategies, visions/goals and key projects- [6, 7]

Strategy	Date of Publication	Vision/Goals	Pillars	Major Focus/ Initiatives/ Key Priority Projects
'Towards e-government: Vision and Strategy for the Public Sector in Denmark'	January 2002	The vision for digital management is that digital technologies are systematic used to innovate and change organizations and work processes to increase service quality and efficiency.	<ol style="list-style-type: none"> 1. Digital management must rust citizens and businesses to the network community 2. The public sector must work and communicate digitally 3. Public sector services must be coherent with citizens and businesses in the center 4. The tasks in the public sector must be performed where they are handled best 	Digital Collaboration: Digital Signatures
e-Government Strategy for the period 2004–2006: Den offentlige sektors strategi for digital forvaltning 2004–06 - realiserings af potentialet (Public sector strategy for digital management 2004–06 - realization of potential- Own Translation)	February 2004	Digitization must help to create an efficient and coherent public sector with high service quality, where citizens and businesses are at the center.	<ol style="list-style-type: none"> 1. The public sector must provide coherent services with citizens and companies in the center 2. Digital management should create increased service quality and release resources 3. The public sector must work and communicate digitally 4. Digital management must be based on a coherent and flexible IT infrastructure 	Efficient Payments and Internal Digitization: Nemkonto, Virk.dk

Table 1 Continued

Strategy	Date of Publication	Vision/Goals	Pillars	Major Focus/ Initiatives/ Key Priority Projects
			5. Public leaders must go first and ensure that their organization can realize the vision	
Towards Better Digital Service, Increased Efficiency and Stronger Collaboration	June 2007	The public sector must provide a better, more coherent and efficient digital service for citizens and businesses.	<ol style="list-style-type: none"> 1. Better Digital Services 2. Digitization should make it easier to increase efficiency 3. Stronger collaboration should generate digital connection 	Common Infrastructure: NemID, Digital Post
The digital path to future welfare (e-government strategy 2011–2015)	August 2011	Accelerate the adoption of digital solutions in the public sector to capitalize on Denmark leading position and take the next steps on the way to future welfare services.	<ol style="list-style-type: none"> 1. No more printed forms or letters 2. New digital welfare 3. Digital solutions for closer public sector collaboration 	Digital Communication: Digital Post, Online Self-service, The Basic data Program
Common Public Sector Strategy for Digital Welfare	September 2013	To accelerate the transformation already under way, so that core services in the healthcare sector, in the social area, and in education are underpinned digitally	<ol style="list-style-type: none"> 1. The public as more active partners 2. More efficient and cohesive welfare 	Dissemination of Telemedicine, Digital learning and Education, Digital collaboration in Health and Education, Welfare technology in Nursing and Care
A stronger and more secure digital Denmark-Digital Strategy 2016–2020	May 2016	Public sector digitization creates value and growth, it provides efficiency improvements and it secures the confidence of Danish people in the digital society.	<ol style="list-style-type: none"> 1. Digital solutions must be easy-to-use, quick and ensure high quality 2. Public sector digitization must provide good conditions for growth 	Clear legal framework for e-government, Better data about disabled and marginalized adults, Digital tendering procedures and procurement,

(Continued)

Table 1 Continued

Strategy	Date of Publication	Vision/Goals	Pillars	Major Focus/ Initiatives/ Key Priority Projects
			3. Security and confidence must be in focus at all times	Common data on topography, climate and water Digital skills for children and young people
Strategy for ICT management in central government	November 2017	Mandatory compliance to central government's ICT system management model and periodic reviews by the National ICT Council of each ministry's ICT system management	<ol style="list-style-type: none"> 1. Efficient and responsible management of ICT systems 2. Targeted and value creation management of IT projects 3. Coherent Central Government ICT 4. The right skills 5. Financial Management 	<p>Data sharing between central government authorities</p> <p>Partnerships for ICT development</p> <p>A common central government digital academy</p>
Strategy for Denmark's Digital Growth	2018	<ol style="list-style-type: none"> 1. Trade and industry must tap into the potential for growth inherent in digitalization 2. The best conditions for digital transformation of business 3. Everyone should be equipped to operate in the digital transformation 	<ol style="list-style-type: none"> 1. Digital hub for stronger digital growth 2. Digital enhancement of SMEs 3. Digital skills for all 4. Data as a driver of growth in trade and industry 5. Agile regulation of trade and industry 6. Strengthened cyber security in companies 	Technology Pact
Danish Cyber and Information Security Strategy 2018–2021	May 2018	Citizens, businesses and authorities must be familiar with and be able to manage digital risks, such that Denmark can continue to use digital solutions to support the development of the society.	<ol style="list-style-type: none"> 1. Everyday Safety 2. Better Competencies 3. Joint Efforts 	<p>Creating a national cyber situation centre</p> <p>Information portal</p>

The Danish eGovernment strategy, ‘Towards eGovernment: Vision and Strategy for the Public Sector in Denmark’ [17], is published in January 2002. It sets out a vision to systematically use digital technologies to introduce new ways of thinking and to transform communication and collaboration. This is still the basic concept behind the Danish approach to e-government. It is considered as the beginning of joint digitization co-operation between the municipal, regional and state levels of the administration. This strategy was revised and a new eGovernment Strategy for the period 2004–2006, “Den offentlige sektors strategi for digital forvaltning 2004–06 - realisering af potentialet” [18] was launched as a result in 2004. The e-government strategy for 2004–06 further strengthened the focus on the development of the internal public-sector digitization and efficient payments.

The e-government strategy for 2007–2010 [19] focused instead on common infrastructure and established new standards for the development of citizens’ services and cohesion across the public sector. The main idea of the strategy is that the public sector should deliver better, more cohesive and efficient digital services to citizens and businesses.

The strategy developed in 2011–2015 [20] puts again focus on increased digital communication and cross-agency cooperation on public sector’s digital infrastructure and shared use of data, as well as the promotion and development of shared solutions.

In 2013, the Danish Government, Local Government Denmark and Danish regions launch again a new strategy “Common Public Sector Strategy for Digital Welfare” [21]. The strategy has the main goal of improving the welfare of the Danish society through digital solutions. Digitalization should provide the citizens with better opportunities to contribute to welfare as well as public authorities should exploit digital solutions to increase efficiency, cooperation, and knowledge sharing.

In 2016, the Danish government launches the strategy “A stronger and more secure digital Denmark-Digital Strategy 2016–2020” which sets focus on user friendliness and high quality, growth and security [22].

In January 2018, the Danish government launches again two new digital strategies. The first, “Strategy for Denmark’s Digital Growth”, consists of 38 initiatives, structured under seven main pillars. The strategy aims at bringing Denmark to the forefront of the digital development, to create the best foundation for Danish companies and exploit new sources of digital growth [23]. The second strategy, “Danish Cyber and Information Security Strategy 2018–2021”, focuses on improving Internet security and will involve 13 ministries [23]. This strategy will secure better protection of critical

government IT systems, it will improve citizens, businesses' and authorities' knowledge and skills on how to protect themselves and it will strengthen national coordination and cooperation on information security [23].

The overall digital agendas formulated at state level have given rise through the years to spin off strategies focusing and addressing specific elements of the overall digital agenda.

Since the very beginning of the digitalization plan in Denmark, broadband goals and policies have been linked to digitalization initiatives and have been supported by a number of political initiatives both at central government, regional and municipality level aiming at nation-wide fixed and mobile broadband coverage. For example, according to the European Commission [24] Denmark has the goal of making 100 Mbps download and 30 Mbps upload speeds available for all households and businesses by 2020. The broadband strategy contains initiatives concerning framework conditions for operators, municipalities and regions as well as consumer-related issues.

3.3.2 Stakeholder involvement at national/local government (2000–2018)

The Danish public sector is characterized by a high level of decentralization. The public administration is divided into three levels, state, regions and municipalities, which collaborate closely through the tasks and obligations laid down in the legislation adopted by the Danish Parliament (OECD, 2010). Traditionally, the three levels of government, Danish Government, Local Government Denmark and Danish Regions have collaborated since the beginning in developing and implementing the e-government policies and strategies. Their work has been then accomplished, supported and coordinated through governmental agencies under the umbrella of different ministries. Task forces lasting several years and spanning several strategic agendas as well as a number of more temporary commissions have also been established. Such commissions and task forces have changed according to the plans and needs of the moment. Recent examples include the digital growth panel and the Danish government's disruption committee.

Some actors such as the Ministry of Finance and Ministry of Industry, Business, and Financial Affairs have always been involved from the beginning together with Ministry of Energy, Utilities, and Climate, which is responsible for broadband coverage. A few actors have changed name over time by keeping the same tasks or have merged with other actors (European Commission, 2017b).

Finally, the administrative and political structure of Denmark has been also changed over the years to adapt to e-government developments and make its implementation possible. An important example is the structural reform of the local government in 2007 mentioned above, which by reducing the number of regions and municipalities has simplified the political structure by simultaneously increasing the size of each single unit, thus also increasing the budgets that each municipality or regions had available to implement e-government (Statistics Denmark, 2018). Please refer to Table 2 below for a detailed description of the state government, regional government and municipalities in development, implementation, coordination and support of e-government in Denmark.

Table 2 e-Government stakeholders-level, name and roles (Based on JoinUp Report, 2018)

Government			
Level	Role	Stakeholder	Description
National e-Government	Policy/ Strategy	Ministry of Finance	The Ministry is the main initiator of strategies and policies related to eGovernment in Denmark. The strategies are based on the idea that the public sector must constantly develop and improve work procedures and methods to deliver the best possible service provision. The Ministry of Finance develops initiatives concerning administration, public leadership and digitalization to improve the efficiency of the public administration.
		Agency for Digitization, Ministry of Finance	The Agency for Digitization is rooted in the Ministry of Finance and was established in November 2011 to substitute the National IT and Telecom Agency. The Agency's main responsibility is to contribute to the accomplishment of the political vision, the strategy and the understanding and development of relevant technology.
		Ministry of Industry, Business, and Financial Affairs	The Ministry of Industry, Business, and Financial Affairs is responsible for digital aspects of policies related to the general business environment, including business regulation, intellectual property rights, competition and consumer policy, the financial sector and shipping. The Ministry acts to promote digitization within the business environment and in relation to public services for businesses.

Table 2 Continued

Government Level	Role	Stakeholder	Description
		The National Business Authority	This agency is responsible for the Danish business portal. Public sector digitization towards businesses takes place in coordination with the Ministry of Finance.
		Ministry of Energy, Utilities, and Climate	The Ministry of Energy, Utilities, and Climate is also responsible for the telecommunication policy, including roaming, competition regulation, and mobile and broadband penetration.
	Coordination	Agency for Digitization, Ministry of Finance	The Agency has strategic, professional and technical competences facilitating one of its main roles, which is to assume the responsibility to implement and run eGovernment strategy and policies from concept to output. Therefore, the Agency coordinates efforts and relevant actors to ensure the benefits of realization of the eGovernment strategy. The Agency coordinates the national eGovernment Strategy and the Steering Committee for the eGovernment Strategy, which consists of stakeholders from all levels of government.
		Agency for Governmental IT Services, Ministry of Finance	The Agency for Governmental IT Services (<i>Statens IT</i>) was established on 1 January 2010 as a shared service centre for central government providing basic ICT services by merging eight ministries' operational ICT organizations. In the period 2010–2014, a number of projects harmonized and standardized different ICT platforms into one common operational platform to gain higher quality and lower costs through economy of scale.
	Implementation	Agency for Digitization, Ministry of Finance	The Ministry of Finance – besides its role in setting the overall eGovernment strategy – develops and implements initiatives concerning administration, public leadership and digitalization to improve the efficiency of the public administration. The Agency is responsible for the implementation of the strategy.

(Continued)

Table 2 Continued

Government Level	Role	Stakeholder	Description
		Government Departments and Agencies	Individual Government Departments and Agencies implement eGovernment projects falling within their respective areas of competence, as well as individual action plans decided at cross-governmental and departmental levels.
	Support	Agency for Governmental IT Services, Ministry of Finance	Government IT has the responsibility of running an efficient IT support and ensuring high and consistent IT services across Denmark. Its main tasks include the support, development and harmonization of IT throughout the territory.
		Ministries' Project Office, Ministry of Finance	The Ministries' Project Office, which resides within the Agency for Digitization, Ministry of Finance, offers advice and coaching to public institutions that implement large IT projects. Its task is to develop and maintain the common IT project model for the state.
	Audit/ Assurance	National Audit Office of Denmark	The National Audit Office of Denmark is a public institution that audit the State accounts and examine whether State funds are administered in accordance with the decisions of the Parliament. The Office carries out both financial audit and performance audits.
	Data Protection	Danish Data Protection Agency	The Danish Data Protection Agency controls the processing of data according to the Act on Processing of Personal Data. The Agency mainly deals with inquiries from public authorities or private individuals, but can also take up cases on its own.
Regional & Local eGovernment	Policy/ Strategy	The government's Economic Committee	The government's Economic Committee is the overarching committee responsible for economic co-ordination of public sector digitization and serviced by the Ministry of Finance.
		Local Government Denmark (LGDK)	Local Government Denmark is the National Association of Local Authorities (communes). It is represented in the Steering Committee for joint-government cooperation (STS) on behalf of the local authorities in order to report relevant information from the central government to the local authorities.

Table 2 Continued

Government Level	Role	Stakeholder	Description
		Danish Regions	Danish Regions is the National Association of County Councils. The Danish regions are represented within the Steering Committee for joint-government cooperation (STS) alongside Local Government Denmark (LGDK).
	Coordination	Municipalities and regions, Ministry of Finance	Municipalities and regions play a central role in the public sector. The Ministry of Finance, with the involvement of several other ministries, is responsible for coordinating the budget annual negotiations between the government and, respectively, Denmark and Danish Regions and follow up on agreements concerning eGovernment and related projects.
	Implementation	Municipalities and regions	The 98 municipalities are responsible for handling most tasks related to citizen service delivery, including: social services; child care; elderly care; health care; employment; culture; environment and planning. The five regions are mainly responsible for the health sector e.g. hospitals. Municipal and regional bodies implement the individual action plans previously articulated at cross-governmental and departmental levels and by domain area, in compliance with the overall national eGovernment strategy.
	Support	Local Government Denmark (LGDK)	Local Government Denmark's mission is to safeguard the common interests of the local authorities, assist the municipalities with consultancy services and ensure that local authorities are provided with relevant up-to-date information.
	Danish Regions		Like the Danish municipalities, Danish Regions represents the five regions at negotiations with central government and ensure that regional authorities are provided with relevant up-to-date information.

3.3.3 Funding and budgets for e-government

The e-government funding scheme in Denmark is complex as all authorities and government levels are responsible for their own digitization as part of continuous business maintenance and development. The main idea is that the state government makes available seed money that has to be supplemented by economic resources invested by all parties involved. The joint public efforts (e.g. joint-solutions) need separate funding. This is illustrated here briefly with the financing of the strategies 2018–2025, 2007–2010 and broadband roll-out.

In February 2018, the Danish government has allocated almost DKK 1 billion until 2025 for the implementation of the initiatives in the strategy “Denmark Digital Growth 2018–2025” [25, 26]. DKK 75 million has been allocated in 2018, DKK 125 million annually from 2019 to 2025, and DKK 75 million permanently thereafter. The funds have been allocated until 2021, where an evaluation of the major initiatives will be carried and future actions decided upon based on the evaluation. Some initiatives including the Technology Pact and Digital Hub Denmark are long-term financing. According to the strategy [25, 26], the allocated funds are “seed capital” to help to set up a range of initiatives that are of a test nature or public-private partnerships. Private operators are expected to help to scale up the initiatives, while some initiatives are covered by the individual ministries. In addition, the new national strategy for cyber and information security has allocated an extra DKK 100 million to strengthen Denmark’s ability to fight computer crime and attacks.

For the implementation of the digital strategy 2007–2010, according to the OECD e-Government report (2010), the state, the regions and the municipalities financed equally the appropriations of DKK 268 million to implement the 35 initiatives of the joint e-government strategy 2007–2010; DKK 20 million per year 2008–2010 for the general activities of the Digital Taskforce [27]. Similarly to the financing model of the strategy “Denmark Digital Growth 2018–2025”, the DKK 268 million were used to finance only the most central initiatives. Some initiatives were financed by the specific parties as for example the Ministry of Finance (initiative on public registers), the Ministry of Economics and Business (initiative on the business portal), and Local Government Denmark and Danish Regions (initiative on digital leadership). Other initiatives have additional joint cross government appropriations in the yearly political negotiations concerning the budgets of the municipalities and the regions. An example is the appropriation of a new ICT security infrastructure (PKI infrastructure) supporting digital signatures worth DKK 205 million for the period 2009–2014 [27].

Concerning broadband, the bone structure for digitalization, Denmark's primary goal has been to base the roll-out of high-speed network infrastructure on private investments [27]. Municipalities have the role of coordinating and promoting the process in cooperation with telecommunication operators. Public funding should help finance broadband in areas with poor broadband coverage. For example, a tax deduction for private households upgrading or establishing broadband access was approved in 2016. The deduction can amount to a maximum of DKK12 000 (EUR 1 600) per household.

4 Conclusions

Falch and Henten (2000) already in 2000 examined Denmark's policy report, Digital Denmark on the 'conversion to a network society', which followed the Information Society 2000 report published in 1994 [28]. They stated that Denmark provided an interesting case study because it ranked high in the benchmark indicators of information network society developments. This position was obtained largely by public sector initiatives and without erosion of the highly reputed Scandinavian model for a welfare society. In addition, Falch and Henten (2000) showed that the Danish government had a vision and an ambition of being the best or among the 5 best countries in embracing information technology for public services and in the society as a whole [28]. This study shows that Denmark has succeeded in achieving its goal. In fact, after two decades, according to the Digital Economy and Society Index (DESI) report 2018, Denmark ranks first out of the 28 EU Member States and it has done so for the last several years [29]. Denmark belongs to the high-performing cluster of countries and is a leader in digitization in the world. Denmark together with Sweden, Finland, and the Netherlands have the most advanced digital economies, followed by Luxembourg, Ireland, the UK, Belgium and Estonia. By applying a process tracing method, this study argues that the explanation has to be found in a number of factors analyzed above and summarized below.

First of all, there are a number of situational mechanisms that are at the basis of the present Danish digitalization level. Denmark is a relatively small country with a population of 5.8 million inhabitants, it has a relatively low unemployment level and a well-educated population (for example only 19 per cent of the population had basic school as their highest level of completed education in 2018). In addition, Denmark has a significant surplus on the balance of payments due to exports exceeding imports (e.g. 7.3 per cent of GDP in 2016).

The Danish public sector is characterized by a high level of decentralization. The public administration is divided into three levels, state, regions and municipalities corresponding to the three levels of government: Danish Government, Local Government Denmark and Danish Regions. The Danish administrative and political structure has been changed over the years to adapt to e-government developments and make its implementation possible. An important example is the structural reform of the local government in 2007, which by reducing the number of regions and municipalities, has simplified the political structure by simultaneously increasing the size of each single unit, thus also increasing the budgets that each municipality or regions have to implement e-government.

Secondly, there are a number of actions and transformational mechanisms that have led to Denmark being a world leader in digitalization. The main actions are represented by the digital policies and laws that the Danish government has developed and launched since 2002. Each agenda/strategy builds on and further develops the goals and the objectives of the previous ones. For example, the first digital agenda of 2002 builds on the digitalization initiatives of the 1990s' by starting with laying the foundation for digital collaboration within the public administration and between the public administration and the citizens. Citizens can send e-mails to public authorities. Then the agenda was revised in 2004 and extended to include a mandatory default citizens account for payments from the authorities (NemKonto), e-invoicing, a digital portal for public services to be used by businesses (Virk.dk) and a platform for personal access to all health data (Sundhed.dk). The strategy formulated in 2007 further builds on these previous key projects by developing common infrastructure with three key initiatives. The first included NemID, NemLog and eIndkomst. The second strengthened the online communication from the public authorities to the citizens through several key projects such as "Digital Post", NemSMS and Borger.dk, a web portal for public services for citizens. In addition, the strategy also set guidelines for the authorities to use a common IT infrastructure and avoid IT "silos". The 2011 strategy again further strengthens the collaboration between public authorities, citizens, and businesses by making online solutions such as digital post and online self-service solutions mandatory for both business and individuals. The strategy also start disseminating digital welfare services and develops the "Basic Data Program". After having laid a good solid foundation for the digitization of the public sector, the most recent agendas shift attention to cyber security and welfare services such as health services and education as well as ICT management within the public administration. In addition, the two most recent

strategies also shift focus to trade and businesses including SMEs and maritime sector.

The three levels of government, Danish Government, Local Government Denmark and Danish Regions have collaborated since the beginning in developing and implementing the e-government policies and strategies laid down in the legislation adopted by the Danish Parliament [27]. Their work has been accomplished, supported and coordinated through governmental agencies under the umbrella of different ministries. Task forces lasting several years and spanning several strategic agendas as well as a number of more temporary commissions have also been established. Such commissions and task forces have changed according to the plans and needs of the moment. Recent examples include the digital growth panel and the Danish government's disruption committee. Some actors such as the Ministry of Finance and Ministry of Industry, Business, and Financial Affairs have always been involved from the beginning together with Ministry of Energy, Utilities, and Climate, which is responsible for broadband coverage. A few actors have changed name over time by keeping the same tasks or have merged with other actors.

Since the very beginning of the digitalization plan, broadband goals and policies have been important and linked to digitalization initiatives and have been supported by a number of political initiatives at central government, regional and municipality level aiming at nation-wide fixed and mobile broadband coverage. Broadband strategies, for example, contain initiatives concerning framework conditions for operators, municipalities and regions as well as consumer-related issues.

The funding scheme of e-government in Denmark is complex as all authorities and government levels are responsible for their own digitization as part of continuous business maintenance and development. The main idea is that the state government makes available seed money that has to be supplemented by economic resources invested by all parties involved. The joint public efforts (e.g. joint-solutions) get allocated separate funding.

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Biography



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