Open Government Data and Impact: A study of the Danish Basic Data Programme

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Abstract

The latest academic literature on open government data (OGD), open government data initiatives (OGDI) and related policies reveals a gap in the knowledge on how such initiatives and policies may stimulate OGD (re)use and value creation. By examining the Danish 'Basic Data Programme' (BDP) initiative, this thesis analyses whether and how this policy framework enables value creation among public and private stakeholders. The thesis found that the BDP enables OGD (re)use among various public and private stakeholders and leads to different types of value creation. Moreover, the analysis found interrelationships between several factors and objectives present in the BDP and its data distribution framework and the uptake of OGD by relevant stakeholders. The most significant factors were accessibility to and affordability of OGD and data quality in terms of accuracy and reliability.

Keywords: *open government data; open government data initiatives, open government data policies, value creation, public value, public sector efficiency and economic growth.*

1. Introduction

1.1. Overview

Digitalisation of the public sector is no longer a new phenomenon. However, how new technologies, and the data that they generate, are utilised and integrated in public policies and government remains current (Giest, 2017). For instance, the availability of big and open linked data may have a profound influence on policymaking as well as public and private innovation (Janssen et al., 2017). Governments are sitting on a treasure trove of data collected through the performance of public tasks. The quantity and centrality of this data makes it especially significant for private sector innovation and commercial value-added services. Open government data (OGD) has the potential to add value because it offers data that has already been produced by government to be re-used by third party users for various purposes other than originally intended (Attard et al., 2015) This could result in new innovation of public or private products and services and/or accomplishing efficiency gains which then may lead to economic growth either in new jobs created, revenue increase or costs reduction in private and/or public administration (cf. Capgemini, 2013; Jetzek, 2014, Ubaldi, 2013). Therefore, OGD may bear economic value if exploited by third parties, e.g., individuals or businesses, for new use or new insight. The publishing of government data can provide opportunities to create new services which both can contribute to profit generation as well as contribute to the common good, and in turn potentially contribute to economic growth (Attard et al., 2015 p. 263).

Since the mid-2000's open government data initiatives (OGDI) aimed at unlocking this data have proliferated (Ubaldi, 2013). As such, since the first strategies and initiatives on OGD were launched there has been ongoing attention on the potential of open data and how these can be realised through open data policies and initiatives (Zuiderwijk & Janssen, 2014; Bertot et al., 2014). One of the main motivations behind OGDI have been the potential benefits and values that can be generated by making data open and accessible to private actors, such as citizens, civil society and businesses (Ubaldi, 2013; Capgemini, 2013; Jetzek et al., 2014; Zuiderwijk & Janssen, 2014; Attard et al., 2015). Although the main guiding principles of the early OGDI – as advertised by the Obama Administration in 2009 – have been to promote transparency, participation and collaboration to improve the quality of public service and government accountability, the key incentive of OGD has increasingly also been targeted at the economic value potential of open data – specifically the aim to stimulate economic growth, data-driven innovation and efficiency among various stakeholders, including private companies (Janssen & Zuiderwijk, 2014; Bertot et al, 2014; Jetzek et al., 2014; Ubaldi, 2013; Capgemini, 2013).

However, realising the value potential of open data and OGD depends on whether data is being used (Attard et al. 2015). Open data and OGD does not hold any value if not used. This implies an interconnection between policy aims to open government data, the strategic objectives and impact that policy aims to achieve, and the policy elements necessary to drive data uptake by third parties. Furthermore, setting up frameworks around open data and OGD is not of much help if no incentives exist to encourage and leverage its usage. As such, OGD may enable economic growth, but only if it is valuable and usable for the users who have an interest in using it, e.g., by increasing business activity or public sector efficiency (Janssen et al., 2012; Zuiderwijk & Janssen, 2014; Capgemini, 2013).

The arguments behind the OGD movement have predominantly been based on the social and economic arguments to encourage the opening of government data (Ubaldi, 2013). The social argument has mainly been rooted in the assumption that open government strategies generate more transparency of government information, thus leading to greater government accountability through democratic control, i.e., the empowerment of citizens through access to government information and decision-making procedures (Huijboom & Van den Broek, 2011; Bertot et al, 2014; Zuiderwijk & Janssen, 2014). Fundamentally, the underlying assumption is that OGDI can provide a mechanism for institutional transformation, which will lead to more government openness and transparency as some of the basic criteria for the idea of 'open government' (cf. Bertot et al. 2014; Janssen et al., 2014; Harrison et al., 2012). In this regard, open data became an integrated part of the idea of 'open government' initiated by the Obama government (Bertot et al. 2014).

The open government directive was developed to provide a mechanism for institutional transformation in which big and open data was seen as key components – also to drive objectives such as economic growth, job creation, innovation and efficiency (Bertot et al. 2014). From this perspective, OGD has progressively been considered as a critical resource with the potential to fuel changes in value creation economically, socially and politically. This is done by creating not only conditions for more socially inclusive service delivery and participatory democracy, but also conditions for stimulating economic growth by allowing the possibilities for third parties to improve and/or create (new) products and services using OGD (Ubaldi, 2013 p. 4-5). Following prior reports on open data, there has been an increased focus on how governments should take more measures to unlock the economic potential of open data in terms of the commercial use of open data by private businesses realising revenue growth through improving and/or innovating (new) services and products (Capgemini, 2013; Deloitte, 2013; European Commission, 2018).

On this basis, the definition of value potentials derived from OGD may be considered a public value which concerns the product of government produced benefits partly derived from the direct usefulness of such benefits and partly derived from its impartiality and fairness of the production and distribution of these benefits, thereby meeting citizens expectation from public institutions. From this perspective, one may consider various levels of governments and stakeholders in which initiatives may deliver different public values depending on what kind of interests and desired policy objectives are in play (Harrison et al., 2012 p. 90; see also Zuiderwijk & Janssen, 2014; Pereira et al., 2016). Another anticipation of OGD value potential has been the unlocking of economic value, which is also part of the public value framework (Harrison et al., 2012; Ubaldi, 2013; Magalhaes & Roseira, 2017).

In sum, open data policies are assumed to have the potential to drive institutional transformation, i.e., increase participation and social inclusion of open data users, such as citizens, as well as stimulating both economic growth and data-driven innovation by both public authorities and private companies (cf. Zuiderwijk & Janssen, 2014 p. 17; Jetzek et al., 2014). Despite the estimated economic and social value potentials of OGD, data does not bear an intrinsic value. It is generally assumed that the availability of OGD leads to immediate benefits such as 'open government' and 'economic growth' (Janssen & Zuiderwijk, 2012; Jetzek et al., 2014; Attard et al., 2015). However, open data only bears value if used by third parties (cf. Janssen et al., 2012). Furthermore, different stakeholders, such as government, private businesses, citizens and civil society, are expected to make use of OGD for various purposes. Therefore, it is important to note that different values require different data

types, also depending on the interests of different stakeholders (Ubaldi, 2013 p. 12). As such, the values that are realised should be examined from a multiple stakeholder perspective (cf. Ubaldi, 2013; Pereira et al., 2015). Even though the past policy developments have shown similarities, open data policies may emphasise different objectives. These differences may furthermore indicate that open data policies stimulate the provision, distribution and use of OGD in different ways, which may lead to different effects and outcomes (Janssen & Zuiderwijk, 2014).

A large part of the academic research literature on OGD has been focused on the implementation of OGD, i.e., the input, effort and incentives by public authorities to publish OGD and make it accessible for potential (re)use (Zuiderwijk & Janssen, 2014; Jetzek, 2015; Attard et al., 2015). However, as stated in the previous paragraphs, for OGD to have added value one must consider how open data is re-used by stakeholders and for which purposes. Still, the literature on the actual use of OGD by both private and public entities is scarce. There is especially a lack of literature focusing on the intention behind OGDI regarding OGD users, its policy impact and projected outcomes (Zuiderwijk & Janssen, 2014; cf. Jetzek, 2015). Prior literature suggests that future research and practitioners consider the need to understand the user-side (demand side of the open data), not only in order to improve and make these initiatives more effective, but as a pre-condition to realise the benefits aimed to achieve. As such, policies ought to be more driven by impact and public value delivery, and how the intuitional set up should be transformed to achieve this (Zuiderwijk & Janssen, 2014). Especially because impact and re-usability suggested to be conditioned by how data is made available. On this account, this thesis explores this gap and examines whether and how OGDI can encourage and facilitate conditions for value creation by third party (re)use of OGD. This follows a prerequisite to consider both the role of OGDI to not only publish but also stimulate the usage of OGD considering various potential stakeholders, and whether and how OGD is being used by these stakeholders.

In this context, Denmark is an interesting case because: 1) They have a well-developed IT infrastructure through years of public sector digitalisation and, 2) they already have well-established registers that produce OGD that could be of use for both public entities, individuals and businesses (cf. Jetzek, 2015; Scupola, 2018). Also, in 2011, Denmark joined the Open Government Partnership (OGP), an international initiative aimed at promoting good governance, strengthening democracy and using digital technologies to improve society by, among others, allowing businesses to access public information (Agency for Digitalisation). However, a large part of the efforts and strategies around OGD has been organised around the strategic aim to implement the 'Basic Data Programme' (BDP) with two broad and consistent policy approaches: 1) To make public administration cohesive and more efficient by developing a common IT-infrastructure, and 2) to afford accessibility and capability to (re)use open public data by the public sector, businesses and individuals in order to stimulate public sector efficiency and economic growth (Danish Digital Strategy, 2011; Danish Digital Strategy, 2016; the e-Government Strategy, 2011; see also Jetzek, 2015). Especially the focus on public sector cohesion and effectiveness alongside the potential for value creation by public entities, individuals and businesses has been consistent over the past 10 years of Danish digital strategies and initiatives. Throughout the development of policy strategies, a significant emphasis has likewise been placed on economic benefits and growth potential for both public and private sectors. Finally, Denmark has also been at the forefront with respect to the development of OGDI (European Commission, 2018).

1.2. Research objective and questions

The main goal of this thesis is to study whether and how OGDI help foster value creation. This thesis focuses on value creation for the Danish public and private sectors using OGD. What is of interest is what kind of policy approach(es) the Danish government has taken in terms of data release, availability, re-use and collaborations and whether these approaches are applicable in reaching certain policy goals, e.g., public sector efficiency, economic growth and/or innovation (cf. Bertot et al., 2014; see also Zuiderwijk & Janssen, 2014: Attard et al., 2015). This also presupposes the consideration of whether and how OGD is being utilised by third parties such as public and private sector actors and for which purposes. From this perspective, this thesis has chosen to analyse the initiative 'Good Basic Data for Everyone' also known as the Basic Data Programme, which has been an integrated part of policy strategies on digitalisation in Denmark for the past 10 years (cf. Scupola, 2018; Danish Digital Strategy, 2011; The e-Government Strategy, 2011; Danish Digital Strategy, 2016).

The BDP was launched as a part of the e-government strategy 2011-2015 in which one of the key elements was the increased focus on the reuse of public data across government levels. On this basis, the initiative aimed at the implementation of a new common data distributor platform with the expectation to increase government efficiency and stimulate innovation. The Danish case is interesting because the programme initially aimed to increase public sector efficiency and later shifted heavily towards a focus on the drive to increase innovation and economic growth (Jetzek, 2015, pp. 89-90). Furthermore, the programme entered production in 2020 in which several use cases has been published to account for how different users utilise basic data and how that creates value. Further elaboration on case selection and case description will follow in the third section on methodology. The primary research question of this thesis is:

Does the Basic Data Programme enable value creation in the Danish public and private sectors, and if so, how?

In answering this question, the following sub-questions are considered:

1. What are the key objectives and strategies of the Basic Data Programme? This question is answered through document analysis.
2. What opportunities does the Basic Data Programme provide to the Danish public and private sectors? This question is answered in part through document analysis and in part through semi-structured interviews.
3. How and for which purposes is OGD, available through the Basic Data Programme, being used by the Danish public and private sectors? This question is also answered in part through document analysis of use cases and in part through semi-structured interviews.
4. To what extent can certain value generating mechanism be traced in the process of providing and (re)using basic data – what types of values are produced? This question is answered in part through document analysis of use cases and in part through semi-structured interviews.

The examined use cases represent embedded units of analysis which qualify as an analysis of how basic data is being used by various stakeholders and what types of outcomes are being produced. Considering both the policy and provision of government data (supply side) and the actual (re)use of basic data (demand side) enables this thesis to study whether and how the BDP enables value creation. This also enables consideration of what kind of mechanisms, conditions and structures are present necessary for users to generate value from

OGD, i.e., what factors are stated to have influence on the use of OGD and, thus value creation. This thesis explores the effects and impact of the BDP by examining whether and how the programme provides policy stimulation of OGD use and thus how that may generate value creation. The focus of this thesis aligns with appeals from prior literature to examine policy impact, which suggests more attention should be given on the stimulation of OGD use since such stimulation is considered an important factor in realising intended policy effects (Zuiderwijk & Janssen, 2014). However, since the task to evaluate the impact and public value is complex, this thesis has adopted an explorative approach to examine preconditions and mechanisms present in the Danish case with the aim to provide empirical insight on relevant evaluation measures. Namely, what kind of key factors can be seen that enable relevant stakeholders to harness the benefits of OGD and what kind of preconditions are observable for such engagement (e.g. Ubaldi, 2013). These observations may be useful for both future research and cross-case analysis as well as practitioners developing and improving open data policies and OGDI. Further elaboration is given in sub-section 2.3 on conceptual considerations and section 3, methodology.

1.3. Structure of this thesis

This thesis is organised as follows. In Section 2, the literature review is presented, and the theoretical framework is laid out. In Section 3, the research design and methodology are presented. In Section 4 context and case description of the BDP is provided. In section 5, the results of the data analysis are presented, which include the policy framework, processes and key elements present in the BDP, values and mechanism expressed in the use cases of basic data, and finally, a summary of whether and how the BDP stimulates value creation. The thesis concludes with a concise overview of the main results and a discussion regarding opportunities for further research.

2. Theoretical framework

Prior state-of-the-art research has mainly focused on the conceptual aspects of policy implementation of OGDI and its objectives, e.g., how OGD programmes may generate public and/or economic value (Jetzek, 2016; Attard et al. 2015; Zuiderwijk & Janssen, 2014). However, only limited research has been conducted to investigate whether OGDI lead to specific outcomes where end-users may use OGD to realise benefits and/or (public) value (cf. Zuiderwijk & Janssen, 2014; Jetzek et al., 2014 Kaasenbrood et al., 2015). One of the main challenges underlying OGDI is the anticipation that opening public data immediately produces benefits simply by publishing data (Janssen et al., 2012; see also Attard et al., 2015). However, access to open data does not guarantee value generation in itself; data only bears value if used. Therefore, supporting the use of data should not be secondary to open data policies (Janssen et al. 2012). This notion of OGD value is general expressed within the literature, largely considered as estimates, i.e., anticipated value potentials such as boosting economic growth or enhancement of sector efficiency. In general, research on the actual consumption of OGD and how the (re)use of open data and OGD can generate and harness value and/or benefits in practice is scarce. Especially on how that may reflect on initial policy frameworks which permit and distribute OGD in the first place (Zuiderwijk & Janssen, 2014; Attard et al., 2015; Jetzek et al., 2015).

As stated, the aim of this thesis is to examine and consider this gap in the literature about the usage and exploitation of OGD by public and private sector actors. As such, this thesis analyses the Danish OGDI ‘Good

Basic Data for Everyone', which later developed into the Basic Data Programme (cf. Jetzek, 2015), and how this programme may enable value creation such as public and/or commercial utilisation of open data. This presupposes gathering empirical insights on: 1) How the programme facilitates OGD, i.e., basic data and its use, and 2) whether and how users of basic data may exploit and/or explore these data for different public and/or commercial purposes, i.e., whether and how public and private users may create value from basic data and why. The following sub-section examines the current state of research regarding OGD and OGDI. First, open data, OGD and OGDI are defined. Second, it provides an overview of academic research concerning how government policies can stimulate the use of OGD and related concepts. Third, it reviews and examines the possible benefits of open data and OGD and enablers/impediments, i.e., the factors considered to influence the use of OGD, including what conditions may block and/or enable OGD usage and value creation. Fourth, the sub-section considers how public and private stakeholders are expected to utilise OGD and how that qualifies an analysis to identify the mechanism that generates societal impact of OGD.

2.1. Open government data: policy approaches and implications

Since most OGDI are driven by governmental organisations, the most significant driver seems to be the assumption that OGD will stimulate and generate considerable social and economic value for society. Furthermore, most proponents of OGDI have either been guided by the idea of open government or the creation of public and/or economic value, highlighting the potentials for reusing open data for, among others, innovation and efficiency (Jetzek et al., 2014 p. 64; cf. Ubaldi, 2013; Janssen & Zuiderwijk, 2014; Bertot et al, 2014; Magalhaes & Roseira, 2017). Most of the prior research has focused on the supply side of OGD, i.e., how open data and OGD is published by public data providers. However, there has been a lack of attention to what kind of conditions necessary to influence data (re)use which concerns the user side of OGD (demand side). That is, how certain elements in different policy framework and initiatives may influence both the publishing of OGD as well as the data (re)use, and thus the impact as they are interlinked (Zuiderwijk & Janssen, 2014; Attard et al., 2015). In order to assess such processes, one should consider the role of different policy frameworks as they are key to whether OGD will be consumed (cf. Ubaldi, 2013; Zuiderwijk & Janssen, 2014; Attard et al., 2015).

Data reutilisation is not attained simply by making government data open (cf. Janssen et al. 2012). Re-usability is conditioned by how data is published and by consumers' willingness to participate in this effort. This is not an easy task as several barriers may arise and hinder user participation. Therefore, there is a need for an action plan to stimulate the consumption of data both for the original producers and the consumers. This also necessitates research which considers and examines which factors may influence stakeholders' decisions to participate and consume open data (Attard et al., 2015, p. 414). In this regard, reviewing how OGD is made available is elemental since much of the unlocked potential in government data is suggested to be released by turning it into OGD and whether and how it is being reused by various stakeholders (cf. Ubaldi, 2013, Attard et al., 2015). As such, to examine whether and how OGDI may enable OGD usage, a review of conceptual and empirical research on the subject is required. This sub-section first considers how OGD and OGDI as concepts and phenomena have been defined.

2.1.1. Open data and open government data

Attard et al (2015) define open data as “data that is available, free of charge for the general public without any limitations”. Moreover, Pereira et al (2016), using the reference work of Janssen et al (2012) and Ubaldi (2013), consider open data to be “any data and content that can be freely used, modified, and shared by anyone for any purpose.” Based on these definitions, for the purposes of this thesis, open data is defined as ‘freely available data to the public, which can be accessed and reused for any purpose’. Building on the concept of open data, Attard et al (2015) define OGD as a subset of open data, which is government-related, and is made available to the general public (see also European Commission 2018). Most research uses a similar definition of OGD. Therefore, this thesis opts to use the definition of Attard et al (2015).

It is also important to note that open data and OGD are used interchangeably in current research. Regarding the definition of OGDI, several definitions are being used, which can be summarised as ‘all initiatives that involve government to unlock government-related data and make it available to the public’. Subsequently, OGD is made available by governmental institutions through, mainly, online platforms, in order to, inter alia, enhance public administration efficiency, increase governmental transparency, strengthen public service delivery, foster public and private sector innovation, the latter of which mainly concerns the creation and improvement of (new) products and services by private companies (cf. Janssen & Zuiderwijk, 2014, Kaasenbrood et al., 2015; Magalhaes & Roseira, 2017; Ubaldi, 2013). The following paragraphs provide a brief overview of current research on challenges and guidelines regarding government stimulation of open data and OGD utilisation.

2.1.2. Open government data initiatives: provision, distribution and impact

Government stimulation of OGD use through OGDIs is faced with various challenges. By taking these challenges into consideration, government policies can better encourage the use of OGD. One of the main challenges concerning OGDI is that no agreed upon framework exist when it comes to assessing and evaluating ODGI, both in terms of the effort to publish government data and the re-utilisation of OGD which reflects the actual impact. As such, it is difficult to measure the impact and effect of OGDIs on value creation. Furthermore, a large body of literature examine the factors encountered when publishing and using open data and OGD as these factors may enable and/or hinder open data uptake by third party actors (cf. Zuiderwijk et al. 2012; Zuiderwijk & Janssen, 2014; Attard et al, 2015).

Identified factors that affect open data and OGD use include the concepts of availability, accessibility, data quality and usability. Examining the way government data is made available, including what types of data stakeholders have access to, and how, is closely related to whether data is going to be utilised or not. Examining availability is important because access to OGD can facilitate the opportunity of data consumption by the public which in turn may be linked to the objectives of OGDI which often is the use, (re)use and distribution of data. This is only achievable through the consumption of data by its stakeholders (Attard et al., 2015 p. 408). Therefore, OGD must also be usable for stakeholders for them to (re)use these data which frequently depends on the variables of data quality such as accuracy, completeness, accessibility and openness (Attard et al., 2015 p..414). Thus, a focus on both the data provider (supply side) and users (demand side) is necessary. As such, how data is made available is closely interlinked with the usability of data, i.e., the degree in which data is usable for (re)use (Attard et al., 2015). Still, it is important to note that there is no agreed upon definition when it comes

to these concepts as they are cross-disciplinary and dependent on the specific use case in question (Attard et al, 2015). The following paragraphs further examine: 1) The lack of standardised frameworks, and how it may challenge to determine the effectiveness of OGDI; 2) how the abovementioned aspects are considered to affect open data provision and its uptake, i.e., the adoption and use of OGD, and 3) further related concepts, dimensions and definitions.

The absence of a standard framework to measure and determine the impact and effectiveness of OGD and OGDI is identified as one of the main challenges in the literature (cf. Zuiderwijk et al. 2012; Janssen et al., 2012; Zuiderwijk & Janssen, 2014; Attard et al, 2015). Janssen et al (2012) observe that the diverse nature of open data means that different types of results have different benefits and are therefore confronted with different barriers. As such, treating open data as homogenous topic does not sufficiently acknowledge this diversity. This diversity makes it difficult to measure impact and effectiveness in a generic manner. Zuiderwijk & Janssen (2014) deal with this diversity by considering the policy environment and context, policy content (input), performance indicators (output) and realised public values (impact) of various case studies, identifying their key elements and drawing up a framework for comparison and evaluation of OGDI based on these elements. Since one of the main aims of policies is to achieve a certain impact on society, Zuiderwijk & Janssen (2014) adopt the view that policies should include factors which contribute towards the pursued impact.

According to Zuiderwijk & Janssen "[open data] policies should be seen as more than written documents in which intentions, choices, and actions are described as they define the broad open data regime or organizations and how they are realized and create their actual impact" (Zuiderwijk & Janssen, 2014 p. 16). Therefore, policies should pay attention to gather insight into how data may be useful and valuable. For instance, by examining intended effects of open data policies, users' needs and the way OGD is being (re)used (Zuiderwijk & Janssen, 2014, p. 16). Based on this framework, Zuiderwijk & Janssen (2014) conclude that when planning and developing open data policies to stimulate the use of OGD, government should focus on impact, i.e., how public value is realised rather than solely focusing on internal challenges within the process of publishing data. In this regard, policies should include the stimulation of OGD use as part of the policy as this is an important factor in creating intended effects (Zuiderwijk & Janssen, 2014 p. 27).

Zuiderwijk & Janssen's (2014) study acknowledges that the task to analyse and compare policies remain highly abstract and such examination should also capture details such as policy content. Moreover, government policies stimulating the use of open data should consider communicating their successes, as this is one of the identified elements of effective OGDI. As such, future research should pay more attention to impact and whether open data policies achieve intended objectives, e.g., the creation and realisation of public value (Zuiderwijk & Janssen, 2014 pp. 26-28). Correspondingly, Zuiderwijk & Janssen (2014) suggests a renewed focus on the stimulation of public values and use of open data which implies an interconnection between stated policy objectives such as economic growth, innovation and/or data reuse. As a result, policies ought to be more driven by impact and what the resulting public values should be and how government should be transformed to achieve this. Such achievement presupposes certain conditions necessary to achieve this such as resources, publishing culture, and development of standardisations for data publication (Zuiderwijk & Janssen, 2014 p. 27).

However, reflecting the governments' effort to open access to various data and making them available to the public for (re)use evokes various challenges. One such challenge is the lack of evidence and insight of impact

(e.g. Zuiderwijk & Janssen 2014). Another challenge is related to the question how one measure and evaluate something as complicated as the value of open data and, likewise, how does ODGI sustain validity if no impact is generated (Jetzek et al., 2014 p. 64). In this regard, Jetzek et al. (2014) suggests that before turning to such task one ought to gain a better understanding of to *what end* – meaning what one wishes to achieve with open data – and *by what means* – meaning how this can be engendered (Jetzek et al., 2014 p. 64). According to their study, this presupposes that the technological availability and accessibility of data is conceptually separated from the political openness necessary to drive transparency and accountability. One aspect concerned with the usability of the resource (i.e., open data) is the mechanism in which data is being used for specific purposes (Jetzek et al., 2014 p. 65). For instance, technical features such as machine-readable formats and open licenses affect whether data is truly open. Also, data quality and data reliability (i.e., whether data is up-to-date and delivered in timely fashion) are considered important issues in terms of data availability. Moreover, whereas technological driven services are considered as key to harness the value of open data, several issues still exist related to the usability, availability, and technical infrastructures (Jetzek et al., 2014, cf. Zuiderwijk et al., 2012).

Following this perspective, examining value creation through open data and OGD presumes the consideration and conceptualisation of which elements influence value creation mechanisms, which in turn may lead to specific outcomes. On this basis, Jetzek et al. (2014) observes that governments still have some way to go – from not only embracing the OGD value potential but implementing enabling structures necessary for generating value from OGD (Jetzek et al., 2014 p. 65). In their study, Jetzek et al (2014) provide a conceptual framework which considers both the enabling factors which may enable value generating mechanism and which may positively lead to value creation. As such, governments and policymakers should take into consideration these enablers as policymakers can influence the motivation of users by providing the opportunities to generate value – not only through open access but also through high quality and risk-free data for both internal and external users (Jetzek et al., 2014 p. 69). Though the study mainly focusses on sustainable value as main goal, this thesis considers the factors in corroboration with other research literature on similar subjects. Further elaboration can be found in sub-section 2.2 and 2.3.

2.1.3. OGD publishing and influencing factors

Availability and accessibility are identified as affecting the uptake of open data by third party actors. Concerning availability and accessibility, it is important to consider how data is released to third parties (cf. Attard et al, 2015; Ubaldi, 2013). The two most significant approaches in this respect are the eight open government data principles and Tim-Berners-Lee's five-star scheme for linked open data. The eight principles concern: 1) Completeness of data; 2) primary, meaning that data is made available as is at the source; 3) timely, data made available as quickly as necessary to preserve its value; 4) accessibility, i.e., having minimum limitations on its use; 5) machine processable, which means that data is published in a structured manner; 6) non-discriminatory, requiring availability without registration requirements; 7) non-proprietary formats, i.e., data is published in a format not controlled by a single entity, and 8) license-free, which means that usage does not requiring a license (cf. Attard et al, 2015; Ubaldi, 2013). The five-star scheme is more technical and deals with the maturity of OGDI related to the degree to which the published data is released and is exploitable for third parties. For instance, OGD is typically implemented through data portals, i.e., portals that support the publication of relevant datasets and their respective meta-data. While these portals vary in terms of operators and provenance, a large part of

them are implemented by government as a function of a one-stop-shop facilitating public access to government data and datasets. The design of these data portals affect the distribution of open data and its exploitation. Within the scope of this thesis, the dimensions of the five-star scheme ae used to illuminate the importance of how data is made accessible and how that may influence data-uptake.

For successful publishing and exploitation purposes, it is useful to take the dimensions of accessibility and availability presented in eight open government data principles, and the five-star scheme into account when considering conditions which may enable OGD (re)use or impede such process if absent or deficient. For instance, the issue of accessibility and availability is highly related to the aspect of openness, which is also defined as open access (cf. Jetzek et al., 2014; Kaasenbrood et al., 2015). In this context, prior literature observes that accessibility and availability is strongly connected to the question of data quality and usability, which concerns both the way open data and OGD is made available as well as whether data is being consumed. These dimensions are being identified to be interconnected within the research literature (cf. Attard et al., 2015; Ubaldi, 2013; Zuiderwijk & Janssen, 2014; Jetzek et al., 2014). Literature shows that meta data directly affects the dimension of discoverability, which is central for OGD reuse (Attard et al., 2015). Likewise, quality of data is also considered as an important condition to enable value creation, i.e., the improvement and assurance of data quality in terms of accuracy, consistency and timeliness of published data (Ubaldi, 2013; see also Attard et al., 2015). The most consistent and generic terms of data quality relate to the concept of data usability, which is directly dependent on to what degree data is accessible, open, interoperable, complete and discoverable.

In the literature there is a strong interconnection between accessibility and availability as well between usability and data quality, which is integrated concepts and multidimensional, i.e., how easy data is understandable and usable for the user (quality) and whether data is discoverable through for instance a catalogue (accessible) (Attard et al., 2015 pp. 410-411). However, some of these dimensions and concepts overlap in definitions and attributes. In general, there is a lack of conceptual clarity and agreed-upon frameworks within the literature. Nevertheless, the abovementioned factors and principles all relate to the interrelation between contextual dependent aspects such as data provision, distribution, use and (re)use of open data and OGD. As observed by Ubaldi (2013), creating value from open data and OGD presumes a holistic understanding of the process, from process barriers to data release to the role of various actors, as they are all key factors to enable value creation through OGD. As such addressing issues of data accessibility (to what degree data is open, discoverable and accessible) and usability (which is contingent with the degree of data quality, interoperability and understandability, i.e., data interpretation) are important as they may illuminate factors which may explain the enablement of open data and OGD usage and therefore mechanisms of value creation (Jetzek et al., 2014; see also Attard et al., 2015; Ubaldi, 2013 cf. Kaasenbrood et al., 2015). The issue and relevance of abovementioned factors is further elaborated and summarised in section 2.3.

In sum, research shows that while it is difficult to measure and determine the impact and effect of OGDI, OGD and open data in a generic manner, it is important to focus on their impact and value creation rather than solely on the input. Furthermore, there is a strong interlinkage between how data is published and whether and how it is being used, i.e., whether and how various stakeholders create value through open data and OGD. Moreover, anticipated benefits (incentives) and socio-technical challenges are also considered to affect this process (cf. Zuiderwijk et al., 2012; Janssen et al., 2014). The following sub-section examines the possible benefits and

drivers of open data and OGD use as well as impediments and barriers. Moreover, impediments are examined considering suggested enabling factors to drive and stimulate OGD use and value creation.

2.1.4. Open government data – drivers and barriers for data publishing and (re)use

As stated in the studies of Zuiderwijk & Janssen (2014) and Jetzek et al. (2014), open data policies and OGDI ought to address preconditions necessary to stimulate both OGD (re)use and public value delivery as important drivers for achieving the intended effect such as innovation, growth and public sector efficiency. Looking at drivers (enablers) and potential barriers disclosed from literature provides a better conceptual understanding of *what means* (factors) are considered influential to open data and OGD (re)use and thus the stimulation of mechanism generating public value (cf. Jetzek et al., 2014; Zuiderwijk & Janssen, 2014; Janssen et al., 2012). As touched upon in the introduction, possible benefits of open data and OGD provision in terms of value creation are numerous but, following Janssen et al. (2012), can be roughly divided into three categories:1) Political and social; 2) economic, and 3) operational and technical. First, political and social benefits include transparency, democratic accountability, citizen participation and self-empowerment, improvement of citizen services and/or creating new governmental services to citizens, and improvement of policy-making processes. Second, economic benefits include the stimulation of competitiveness and economic growth, stimulation of innovation, development of new products or services, and/or contribution towards the improvement of processes, products and services. Third, operational and technical benefits include the ability to reuse data, easier access to data and discovery of data, optimisation of administrative processes, fair decision-making by enabling comparison, creation of new databases through combining data, and the ability to merge and integrate data. There are several socio-technical impediments to realising these benefits. Per Zuiderwijk et al (2012), such impediments can be categories as follows:

Data access impediments

1) *Availability and access,* which concerns data collection, license to access, how and which data is available, original or processed, and in which formats, data updates, temporality and regularity;
2) *Findability,* which concerns issues of meta-data and data fragmentation, hampering the discoverability.

Data use impediments

3) *Usability,* i.e., data is available but not readily usable by the public due to, among others, insufficient standardisation and interoperability;
4) *Understandability,* which is the lack of context to place the data in;
5) *Quality,* which mainly deals with the reliability of data, such as accuracy;
6) *Linking and combing data,* which relates to difficulties to merging and meshing data;
7) *Comparability and compatibility*, i.e., differences in types of data and their standards;
8) Meta-data, which relate to a lack of common agreed meta-data.

Data deposition impediments

9) *Interaction with data provider,* which means that there is no mechanism for participation available, and*;*

10) Opening and uploading, i.e., lack of guiding principles and support for opening data.

Looking at impediments along with what kind of incentives that may drive not only the OGDI and policies, but also those who are expected to make use of data, can be used as basis of improvement data processes so that the intended effects can be realised. Since the potential value of OGD is anticipated to be high, realising these effects and creating public value is rather ambitious. Especially because the process where data is published, found, used, linked and (re)used are confronted with some barriers that may impede both the publication as well as the actual usage of open data and OGD (Zuiderwijk et al., 2012 p. 170). In this thesis, the consideration of possible drivers and barriers for open data and OGD provision and (re)use will work as a reference frame to consider possible factors present in the setup of providing and distributing basic data (BDP) and whether these are mentioned in the public available use cases. In this regard, the socio-technical impediments, categorised by Janssen et al. (2012), can also be considered as positive conditions if they are described as reasons or motivations for why stakeholders are willing and able to make use of OGD. Much of the prior literature suggest a focus on which barriers exist and which challenges should be addressed by OGDIs in order to make improvements. However, the study of Jetzek et al. (2014) propose that policy makers should pay attention to how they can motivate users, providing opportunities for value generation (Janssen et al. p. 69). This includes considering enabling factors to create structures necessary for generating value from OGD, which also include the dimensions ascribed as barriers for proper data access and usability.

Drivers or enabling factors suggested by Jetzek et al. (2014) include: 1) *Incenti*ves, which relate to efforts by government to create incentives (motivation) and encourage stakeholders to use data and generate value; 2) *open access,* which is a matter of availability, format, accessibility and license. Hence, openness should combine access with technical interoperability; 3) *governance,* which relates to the importance of data governance that reflects the intended effect of open data and which ensure data quality and management, policies and processes. Furthermore, this includes ensuring data reliability and protection; 4) *capabilities,* which is the ability to generate value from data defined as the ability of an entity to achieve objective. This refers to the individual and collective ability to (re) use open data. And last 5) *technical connectivity,* which concerns the technical ability to manage and disseminate big and small datasets; In order to capture value from data, public and private entities must deploy technology which can help individuals to process and consume such data, i.e., to organise, integrate, analyse and visualise available data (Jetzek et al. pp. 69-72). These concepts overlap in attributes with the other aspects considered previously. However, these are also used as theoretical reference frame as they provide aspects relevant for further data analysis of how and why basic data is being used, i.e., motivators of OGD (re)use. This perspective is also embedded in value creation paradigm which is encouraged by prior research.

Another important aspect is that benefits as well as barriers are likely to change over time. Therefore, these should be determined on a case-by-case basis (Janssen et al., 2012, Zuiderwijk et al., 2012). While the possible benefits and impediments of making open data and OGD available are numerous, there is a lack of research which examines the actual impact of OGDI through observing how OGD is utilised by public and private stakeholders. As pointed out by Attard et al. (2015), it is important to study the utilisation/consumption of OGD since it is central in order to gain a better understanding of which factors may influence external stakeholders'

decisions to participate and utilise OGD. Such a better understanding could substantially increase the effectiveness of OGDI (cf. Zuiderwijk & Janssen, 2014; Kaasenbrood et al., 2015).

Furthermore, different myths concerning OGD potential also reveal the need to address, not only barriers that exist to realise benefits, but also those structures necessary in policy making to enable (re)use and value generation. Despite the expressed benefits, there is a lack of 'how to' question for realising these benefits. Often political stakeholders may assume that making public data available is simply a matter of publishing or that open data automatically results in immediate benefits or open government. Also, that this can be done without any restrictions and that any person can make use of open data. However, for these benefits to be realised presumes open data policies which aim to set up the right conditions and creating the right environment to stimulate open data use (Janssen et al., 2012). As of now, there is a scarcity of knowledge on how data is converted into services of public value. A great deal of attention has been put on the supply-side whereas the success of open data systems (OGDI) depends to large extent on the quality of data provided and data use (Janssen et al., 2012). The next the sub-section considers potential users of OGD, how public and private stakeholders are expected to utilise OGD and their implications.

2.1.5. OGD users, utilisation and implications

Based on the literature, open data and OGD stakeholders are expected to utilise relevant data in manners corresponding to the expected benefits mentioned in the previous sub-section. However, it is essential to differentiate between different stakeholders as their interests to adopt open data and OGD may vary. For example, there is a difference between achieving transparency and accountability of government and aiming to boost economic growth. Ubaldi (2013) differentiates between different groups of stakeholders who utilise open data and OGD for value creation. These groups are: 1) Government; 2) citizens; 3) civil society, and 4) the private sector and public service marketplace stakeholders. First, government stakeholders are expected to utilise relevant data to foster innovation efficiency and effectiveness in government services. An equally important aspect is that the use of open data and OGD may be used by civil servants to participate directly in ensuring that government is open and participative, i.e., to develop applications that better respond to users' needs. Second, citizens are expected to use relevant data to better make decisions and increase their participation in public affairs. Third, civil society stakeholders are framed as intermediaries that use open data and OGD to improve service delivery, particularly to protect specific groups, e.g., environmentalists and vulnerable parts of the population. Fourth, private sector and public service marketplace stakeholders use relevant data to generate economic value, such as improving and/or creating new services and products. As mentioned in the introduction, this is also referred to as the commercialisation of open data and OGD (Ubaldi, 2013).

In terms of OGD usage and impact, the study of Ubaldi (2013) notes that users play a key role when it comes to value creation through OGD. This presumes that government makes efforts to address and understand the context of demand, i.e., consider users' needs and encourage their engagement to drive value creation. However, this is not a high priority among governments (p. 42; cf. Smith & Sandberg, 2018). Furthermore, it also seems that a large body of literature mainly focusses on the potential value of OGD for citizens and the wider economy, rather than understanding value generation for the public sector (Ubaldi, 2013 p. 72). As such, there is a need for further empirical analysis and measurement of the different manners in which OGD is being used. Such analysis is elemental to sustain the evaluation of the social political and economic value of OGD.

Furthermore, gaining a solid understanding of the relationship between data providers (the supply side) and the use of OGD (demand side) may allow a deeper evaluation of the OGD value chain. Such evaluation can also help to inform future investment of OGD provision (Ubaldi, 2013 p. 44). The position of stakeholders within the open data value chain, suggested by Ubaldi (2013), is considered in the final analysis and discussion since it may explain how OGD is used by certain stakeholders and for which purposes – for instance, whether the users are considered as first, second (infomediary) or final end-users. These considerations can be found in the discussion of the research findings in the conclusion. The following sub-section lays out the analytical framework used to analyse how value creation is generated using OGD.

2.2. Value creation through open government data

The concept of value creation can be divided into two concepts, namely public value creation and economic value creation, i.e., the commercialisation of OGD in which private entities/businesses make use of OGD to either enhance existing or innovate new product and services (cf. Magalhaes & Roseira, 2017). The concept of economic value creation is also integrated in the public value frame value in which economic value is considered as a public good, if facilitated by government action (cf. Harrison et al., 2015). As such, there are no strict boundaries between the two concepts. However, it is useful to divide them due to the increased focus over the past decade on the economic potential of open data and OGD. Before turning to economic value creation, public value creation is examined.

2.2.1. Public value creation

Harrison et al. (2012) defines public value creation as the benefits produced by public authorities concerning transparency, participation and collaboration viewed as policies which enable citizens to enact different roles within the policymaking process. However, for these objectives to be meaningful they must enable people to pursue their objective. Subsequently, one must determine what kind of value and such assessment requires a multiple stakeholder perspective and not just from a citizen centric viewpoint (Harrison et al. p. 89). The public value framework is embedded in the transition to open government, which also concerns new waves of e-government and e-democracy. In this thesis the public value framework is adopted because it offers an analytical framework to examine and consider a variety of public values and mechanism suitable to assess the effects and/or products of governmentally produced benefits (cf. Zuiderwijk & Janssen, 2014; Pereira et al., 2016).

Harrison et al. (2012) have developed an analytical framework which contains six types of public values (economic, political, strategic, quality of life, ideological and stewardship) and describe five mechanisms generating value (efficiency, effectiveness, intrinsic enhancement, transparency, participation and collaboration) (Harrison et al., 2012; see also Pereira et al., 2016). Jetzek (2014) suggests a related framework which focusses on sustainable values as the final desired outcome of using OGD. To limit the scope of the present study, this thesis adopts the definition by Harrison et al. (2012). The following paragraphs further examine the previously mentioned benefits, the six types of public values and the five mechanisms for generating value. Regarding the analytical framework and the six types of public values, Harrison et al (2012, pp. 90-91) defines these as follows:

- *Economic* – impacts on current or future income, asset values, liabilities, entitlements, or other aspects of wealth or risks to any of the above;

- *Political* – impacts on a person's or group's influence on government actions or policy, or their role in political affairs, influence in political parties or prospects for public office;
- *Social* – impacts on family or community relationships, social mobility, status, and identity;
- *Strategic* – impacts on person's or group's economic or political advantage or opportunities, goals, and resources for innovation or planning;
- *Quality of life* – impacts on individual and household health, security, satisfaction, and general well-being;
- *Ideological* – impacts on beliefs, moral or ethical commitments, alignment of government actions/policies or social outcomes with beliefs, or moral or ethical positions, and
- *Stewardship* – impacts on the public's view of government officials as faithful stewards or guardians of the value of the government in terms of public trust, integrity, and legitimacy.

The five mechanisms for public value creation are described as follows (Harrison et al, 2012, p. 91):

- *Efficiency* – obtaining increased outputs or goal attainment with the same resources or obtaining the same outputs or goals with lower resource consumption;
- *Effectiveness* – increasing the quality of the desired outcome;
- *Intrinsic enhancements* – changing the environment or circumstances of a stakeholder in ways that are valued for their own sake;
- *Transparency* – access to data or information about the actions of government officials or operation of government programmes that enhances accountability or influence on government;
- *Participation* – frequency and intensity of direct involvement in decision making about operation, policies, or actions of government or in selection of officials, and
- *Collaboration* – frequency or duration of activities in which more than one set of stakeholders share responsibility or authority for decisions about operation, policies, or actions of government.

Harrison et al (2012) suggest using this framework based on the argument that by connecting value types with value generating mechanisms helps assess how a government programme is expected to produce one or more public values. They provide the example that by investing in IT through putting license applications and renewals online may increase efficiency and effectiveness, which can produce strategic and financial public value for stakeholders that use such licenses (Harrison et al, 2012, p. 91). The taxonomy described above provides a framework for analysing the impact of OGDI and whether and how they realise their intended policy goals, thus government-driven benefits. In practice, this thesis follows this taxonomy to determine how and whether the BDP may foster and/or enable value creation among public and private stakeholders in Denmark. The following sub-section examines economic value creation, which has been further developed as sub-category of the public value framework as illustrated in this section.

2.2.2. Economic value creation

Another approach when considering and examining the value created through the (re)use of open data and OGD is addressed by the studies of Kaasenbrood et al. (2015), Magalhaes & Roseira (2017) and Janssen & Zuiderwijk (2014). These studies use the conceptual theory of business models as analytical basis for capturing and exploring the economic value created when private companies make use of OGD. Magalhaes and Roseira

(2017) examine economic value creation defining this as the commercial use of OGD by the private sector for the purpose of creating and/or improving (new) products and services. They adopt the analytical framework of Davies (2010), who created a framework to capture and analyse how open data and OGD are used in a process of democratic change (such as open government) and public sector reform, deriving five non-mutually exclusive processes of open data and OGD use. Although, the framework of Davies is not specifically targeting commercial value use of OGD, it is useful to capture how private actors make use of OGD for commercial reasons and what kind of mechanism are in play. These processes are described as follows (Magalhaes & Roseira, 2017, p. 3; cf. Davies, 2010, p. 5):

- *Data to fact* – individuals may seek out specific facts in a newly open dataset. These facts may support their engagement in civic or bureaucratic processes, or in business planning;
- *Data to data* – sharing derived data (either simply an original dataset in a new format, or data that is augmented, combined with other data, or manipulated in some way. A whole dataset may be shared, an API onto a dataset created, or an interface that makes it easy to download subsets of a large dataset;
- *Data to information* – creating static representation and interpretations of one or more data sources. Leading to visualization, blog posts, infographics and written reports;
- *Data to interface* – creating a means to interactively access and explore one or more datasets. For example, creating a searchable mapping mash-up, or providing a tool to browse a large dataset and crowdsource feedback or scrutiny, and
- *Data to service* – where open government data plays a 'behind the scenes' role in making some online or offline service function. For example, the use of boundary data to route messages reporting potholes to the responsible authority.

This framework is useful for analysing use cases where private sector organisations use open data and OGD for economic value creation purposes. The framework of Davies (2010) is further elaborated in the study by Kaasenbrood et al. (2015), who incorporate these processes under the category of 'value proposition'. In their study they provide a broader framework for analysis to explore what kind of factors influence the adoption of OGD by private companies in the Netherlands, including analytical elements such as data openness and data properties, as well as value properties, value finance and value network. Value proposition captures the process when private companies add value from the use of OGD, e.g., by examining the target group to whom they are adding value to, which also relates to the process suggested by Davies (Kaasenbrood et al., 2015 p. 80). The full framework of the business concept falls beyond the scope of this thesis in which the framework element 'value proposition' is primarily considered in relation to the process of the commercialisation of OGD.

These models can be used for either revenue generation (economic) or public value generation (Janssen & Zuiderwijk, 2014). The following sub-section corroborates the different aspects and conceptual approaches reviewed in the literature and summarises how they are used as analytical references in the further analysis of the BDP and whether and how the programme enables use of OGD, i.e., value creation. Furthermore, the subsection considers which frameworks are used for tracing value generating mechanism present in the use cases and what types of values may be generated from them.

2.3. Conceptual considerations

When examining whether OGD and open data has an actual impact, one should consider data accessibility, findability, usability, and quality, including whether data is up-to-date and whether they are raw or processed, i.e., how data is displayed (Janssen et al., 2012; Zuiderwijk & Janssen, 2014; Ubaldi, 2013, Kaasenbrood et al., 2015; Attard et al., 2015). To capture whether certain key conditions/factors are present in the Danish case, elements of the frameworks explained by Zuiderwijk et al. (2012), Janssen et al. (2012), Ubaldi (2013), Zuiderwijk & Janssen (2014), Attard (2015), Jetzek et al. (2014), Kaasenbrood et al. (2015) have been used to operationalise and structure the data analysis. These have been deductively synthesised and clustered in categories, which includes conceptual element definitions derived from the literature review (see code manual in the appendix). As such, considering these key factors in relation to OGD usage is important when analysing how government may stimulate OGD use and value creation (cf. Ubaldi, 2013). Furthermore, the aspects reviewed and elaborated in the theoretical literature also serves as analytical lens through which the policy framework behind the BDP can be examined (policy environment, context, input and intended output) in order to trace which components are present and how they can potentially explain conditions necessary for OGD use and value generation.

To examine and analyse OGD usage by private and public sector actors, this thesis adopts the guiding principles from the frameworks of Harrison et al. (2012), focusing on public value and Davies (2010) to further consider the economic value of basic data. The economic value in this case is considered qualitatively in terms of how private companies may integrate and/or use basic data for commercial purposes. Hence, this thesis does not aim to provide exact numbers or quantitative measures on whether these companies increase their economic revenue using OGD. Instead, as described in previous sections, the research makes use of the notion of value proposition to consider the added value that ODG may create and what kind of benefits that may produce for the business – also in terms of the target group and the type of service/product they deliver (cf. Kaasenbrood et al., 2015). Though this thesis acknowledges the business concept used as a central concept behind some of the prior frameworks developed in the literature, this approach is not directly applied to this case study since the main aim is to capture value generating mechanism and factors present within the main case as well as the embedded units of analysis which may trigger various types of value creation.

The analysis of the use cases is further compared with the policy framework to make inferences on whether elements present in the BDP, and data policy can be traced in the use cases, representing various stakeholders benefiting from the same programme and data distribution. These cases can further illuminate how and why they make use of basic data and for which purposes which may reflect on the policy framework, i.e., the BDP. Furthermore, the multiple stakeholder perspective is adopted to reflect how that may explain various mechanisms and outcomes produced by the ways in which OGD being utilised, i.e., basic data (cf. Pereira et al., 2016, Ubaldi, 2013). Stakeholder engagement, motivation and user awareness are also considered a key precondition for OGD to have value (cf. Ubaldi, 2013; Janssen et al., 2012). This element is reflected in both case description and policy analysis to make inferences on how the BDP may enable value creation through active user encouragement as well as government user support.

The main expectation following the theoretical and academic literature, is that the BDP provides certain conditions to stimulate value creation and that these conditions are driven by the overarching objectives traceable in

the development of the programme. As such, this thesis has a prior expectation that the BDP, by making basic data available, has generated a certain impact. However, since OGD does not bear value in itself, the study assumes that the impact (actual re-use of basic data) is highly contingent with the prior and ongoing conditions and policy objectives present in the BDP as well as the distribution set-up (data-provision and distribution). Furthermore, as the literature describes OGD as a heterogenous phenomenon, this thesis adopts an explorative approach in which the analysis is guided by theoretical criteria to trace and explore policy elements and value generating mechanism observable in the Danish case – and what types of values are produced, how and why. Moreover, these observations may generate empirical insight into what types of conditions and structures are necessary to stimulate OGD use, and thus value creation. Here it is worth to take notice that such processes may be highly case specific and that policy direction most likely set the tone for data consumption – whether and how it takes place. Thus, the thesis expects to observe and identify potential explanatory variables that may account for ODG usage and generation of value. Also, the environment and context of the BDP are described to enable future generalisation through cross comparative analysis. The next section lays out the research design and methods for the data analysis in relation to the theoretical research perspective.

3. Research design and methodology

This thesis provides an explorative case study which is based on desk research and semi-structured interviews. The research is explorative in nature because OGDIs and their potential impact is a recent phenomenon. Previous research on the topic of data use and reuse discloses diverging conceptual frameworks. Furthermore, empirical studies on actual impact and value creation are scarce. This thesis adopts a case study approach because this is the preferred method when: 1) How questions are asked; 2) the researcher has little or no control over events; 3) when the focus is on a contemporary phenomenon within its real-world context, and 4) when the boundaries between the phenomenon and context are not clear (Yin, 2018; cf. Jetzek, 2015). Furthermore, due to limited empirical insight of how open government data may generate public and/or commercial value (through the re-use of this type of data by stakeholders) the case has been chosen to extend and potentially replicate knowledge based on previous cases and research literature, and because case study is suitable for (relatively) new research areas (Janssen & Zuiderwijk, 2014; Kaasenbrood et al., 2015).

The case selection has been based on the logic of most common case (Yin, 2018) since the aim of this thesis is to capture both the provision as well as the (re)usage of OGD from a particular programme designed as a single point of access to distribute, retrieve and request open data originally produced from various levels of government sources. The users of the programme, then, are considered as embedded units of analysis within the overall core case, i.e., the Basic Data Programme and the common data distributor. On this account, the use cases represent several users who make use of OGD, i.e., basic data, via the same platform and/or data supplier for whichever purposes, thus operating within the same context (Yin, 2018). Based on this, the programme represents the core case of the study based on four following reasons. First, because it acts a single point of access to basic public data (OGD) with the aim to encourage (re)use to potentially boost public sector efficiency, innovation and economic growth. Second, that the initiative embraced a large pool of potential users, which could represent different types and sectors who are making use of basic data. Third, the relevance of the initiative was considered high since literature of OGD usage and impacts is scarce. Finally, the fact that the

programme has been implemented over a large timeframe since 2012, entering production in 2020, makes it possible to detect indicators relevant for both data provision as well as data consumption.

Taking the above into consideration, the initiative was judged to have reached some maturity level when it came to programme development and improvements and could therefore provide relevant insights into how OGDIs may support and enable OGD usage, and thus value-creation (e.g. Smith & Sandberg, 2018). The motivation for selecting the Danish case was mainly rooted in the fact that the programme had opted an approach different from the Obama initiative which focused on transparency and civic engagement. An agenda which was not as high in the Danish case as the Danish authorities were more concerned on the increased demand on public service delivery (Jetzek, 2015 p. 95). Furthermore, the BDP was launched as a part of the common public strategy on digitalisation and e-government with an increased focus on the reuse of public data across government levels and sectors. As such, the programme had an integrated focus on (re)use of government data as a driver for intended impact, i.e., making basic data a driver for efficiency and growth (Jetzek, 2015; the e-government strategy, 2011). From this perspective, the Danish case constitutes a promising venue to examine how policy elements may influence OGD usage due to an initial policy agenda focused on expected programme impact (e.g. Zuiderwijk & Janssen, 2014). Also, as the early desk research showed that use cases had been published on government websites, the case study proved fruitful to incorporate the user side, which is essential to answer the research question. As such, the Danish programme was chosen due to a strong expectation that the case could constitute an exemplary case of a policy framework interlinked to expected impact. An interlinkage, which according to literature had been lacking and which was considered key to successful and effective initiatives (cf. Zuiderwijk & Janssen, 2014).

The case-study design is based on the research approach of theory-building or explanation-building (Yin, 2018; Beach & Pedersen, 2013) in which the study aims to explore, and potentially explain, the mechanism of value creation bounded to a specific case and context, i.e., the Danish Basic Data Programme and the use of Danish basic data defined as OGD. This perspective is useful when the research goal is to examine and analyse case study data by building an explanation about the case. Such a strategy is mainly relevant in explanatory case-study (Yin, 2018). However, since the aim of this thesis is to examine whether certain mechanism (value-creation) and outcomes (public and/or economic value) can be traced and observed in the provision and (re)use of basic data (OGD) – and thus what kind of conditions or factors may be present to potentially explain these – this thesis remains explorative in nature. As such, this thesis does not claim to draw fully and final objective conclusions. Instead, this thesis aims to systematically gather empirical insight about a specific case within a specific context, which may lead to findings that potentially can be generalised to other cases and/or preceding theoretical concepts on this specific research topic.

Furthermore, the research adopts an explorative approach because the exact outcome, i.e., whether value creation takes place within the core case, was not fully known prior to the final research design and question. However, due to the preliminary research performed in September/October 2021 on the Basic Data Programme, it became evident that various use cases of Danish private and public sector actors, using basic data, had been published on the government website under the title ‘data creates value’. Therefore, prior to the complete research strategy, it was evident that value creation had taken place among different types of Danish stakeholders. However, it was unknown how basic data was being used in practice, by whom and what kind of value is

being created using basic data. In addition, the embedded use cases were selected due to the direct access to the government website, i.e., the public agency who is responsible for the basic data distribution under the authority of one of the Danish Ministries.

Taking the above into consideration, this thesis research, as previously mentioned, follows the design of an embedded single-case study in which the population (sample) is represented by multiple embedded units of analysis bounded to a given phenomenon, i.e., the core case of the Basic Data Programme and data distributor (Yin, 2018). Choosing the design of an embedded single-case study enables the research to systematically analyse whether certain conceptual manifestations and attributes can be observed within the core case. Furthermore, how these manifestations may reveal underlying mechanism(s) to explore, and potentially explain, which type of outcomes are produced, how and why (e.g. Beach & Pedersen, 2013; Yin, 2018). Consequently, the conceptual aim of this thesis is to examine how OGD is provided and used and furthermore whether and how this utilisation may generate anticipated value(s) disclosed from prior literature and case specific policy strategies and development.

In sum, this thesis explores what kind of mechanisms (themes) may emerge from the case analysis through the collection of various sources of evidence such as policy strategies, government website and articles, public available use cases and semi-structured interviews. However, due to the scope and timeframe of the research, as well as the limited access to various key stakeholders, the sufficiency of data may be too limited to fully detect and sufficiently explain which main variable(s) may account for the outcomes observed. Instead, this thesis can provide end develop empirical knowledge and rich description of a national programme which provide and distribute OGD and which kind of components (i.e., observable variables) may explain whether and how this programme fosters value creation through relevant stakeholders using OGD for various purposes. The limitations are further elaborated in the section on research quality and limitation as well as in the research discussion of the conclusion. The following sub-sections elaborate the methodology and methods chosen for data collection and data analysis.

3.1. Data collection

The research aims to examine whether and how value creation takes place using Danish basic data (OGD) by various relevant stakeholders. The methods of desk research and semi-structured interviews has been conducted to explore, and possibly explain, conceptual mechanism present in the case of analysis (Beach & Pedersen, 2013; Yin, 2018). As such, the data was collected based on a preliminary desk research of relevant government websites on Danish digital strategies and those responsible for the management and distribution of basic data. The empirical core of the research therefore consists of diverse empirical sources, which provide information about different aspects of the ‘Basic Data Programme’ and the usage of basic data. These include different public documents (policy papers, government websites and articles) as well as stakeholder accounts disclosed in the different use cases and conducted semi-structured interviews. In sum, as a result of the deployment of different data sources rooted in a single case enables the study to examine and analyse both the context of the case as well as generating a series of embedded use cases to draw out key themes, concepts and mechanisms ascribed within the core case (e.g. Davies, 2010 p. 18).

3.1.1. Desk research

The desk research performed between September 2021 and February 2022 led to the collection of public and private use cases of basic data published by the Danish Agency for Data Distribution and Efficiency (SDFE), who governs the supply and distribution of basic data, i.e., the basic Danish public sector data produced from a variety of public registers. These use cases provide the main empirical foundation to examine how open data and OGD are being used, by whom and for which purposes. In this regard, the use cases are part of the document collection because they have been conducted by the authorities (SDFE) and published as articles on the government websites. However, these articles are testimonies and accounts from users on how (and why) they use basic data and what kind of value that creates. Within the same period, relevant policy strategies on digitalisation and government websites content and articles were collected to trace and track relevant changes, components and developments of the programme (cf. Bowen, 2009) and the common data distributor which constitutes the fundamental structure for the provision and distribution of basic data (OGD).

3.1.2. Semi-structured Interviews

The semi-structured interviews were conducted in the period of January and February 2022 with the SDFE and Boliga.dk who make use of basic data as an integrated part of their business. Interviews with relevant stakeholders were chosen to: 1) Gain more detailed insight into the development of the programme and ways in which basic data has been made available by the authorities, and 2) to obtain a better understanding of how and why relevant stakeholders make use of basic data and what kind of value they can generate from this type of data. The semi-structured interviews thus provide more in-depth empirical insights into how and for which purposes basic data is made available (by the authorities), and in turn, how and why it is being used (by relevant stakeholders), which helps analyse whether and how usage of basic data generates societal and/or commercial value. Both interviews were scheduled for 1,5 hours, and both interviews were recorded and transcribed ad verbatim. Before conducting the interviews both interviewees had given consent to the recording, and both participants were given the transcript for review before publishing. Both interviews were conducted via Teams and were explorative in nature. Prior to the interview, a protocol was developed following four key themes with questions designed to capture relevant elements for the analysis, while remaining flexible to accommodate new perspectives. For the policy interview, the guide was developed around subsequent themes, background information about the programme, data provision, nature of basic data users, policy objectives, user communication and perceived value by the public authority of the basic data. For the user interview (private entity) the subsequent themes involved background information, reasons for adopting and applying basic data in their business, the purpose of using basic data, the perceived value of using basic data both economically and for end-users, motivations and/or barriers for using basic data, including the relationship with the data provider. The following sub-section elaborates the methodology and methods chosen for data analysis as well as the quality and limitations of the research.

3.2. Methods and analysis

The analytical strategy adopted to explore and examine the research case data has been guided by the theoretical framework developed from the literature review – however with the flexibility to include aspects that may be a result of the context of the particular case (e.g. Janssen et al., 2012). Hence, the case analysis has

predominantly been conducted through a deductive (theoretical) approach and partly through an inductive approach using qualitative methods to collect and analyse the research data.

3.2.1. Document- and thematic analysis

Document analysis and thematic analysis (cf. Bowen, 2009; Kiger & Varpio, 2020; Magalhaes & Roseira, 2017) has been adopted to identify what kind of conceptual manifestations can be traced in the provision and distribution of basic data (policy development) as well as the practical usage of basic data (use cases) disclosed from the desk research and semi-structured interviews. The document analysis has been chosen as part of the desk research in which various documents has been collected to provide a substantial base of evidence to better inform the research question. Adopting this method, this thesis can provide a systematic procedure to review and evaluate relevant documents which furthermore requires that data is examined and interpretated to extract meaning, gain understanding and develop empirical knowledge (Bowen, 2009 p. 27). Also, as a research method, document analysis is appropriate for qualitative case studies which aim to produce rich description of a single phenomenon, event, organisation or programme (Bowen, 2009 p. 29; cf. Yin, 2018). The use of document analysis is based on following three purposes: 1) To provide context within which the stakeholders operate; 2) as a means of tracking change and development, and 3) as a way to corroborate evidence from other sources (Bowen, 2009). As such, this method supports the aim stated in the research design, which is to gather empirical knowledge on a single programme and gain insights into whether and how it fosters value creation. To analyse the various sources of evidence, this thesis employs thematic analysis (as part of the document analysis) to examine whether and how theoretical concepts, mechanisms and anticipations on OGD may be inferred from the embedded use cases of analysis. Adopting thematic analysis enables this thesis to explore and examine whether the use of OGD by various stakeholders may generate value, why and how, i.e., what kind of mechanism are observable (manifested), what types of outcomes do they generate, and what kind of motivations (reasons) are stated to enable these processes. The analysis procedure, thus, has been motivated by prior theoretical framework elements as guiding principles for the data analysis while being open to (new) aspects which may surface from the empirical data collected.

3.2.2. Case analysis and measurements

The method of case study has been chosen as main qualitative method to collect data and to make inference about how the BDP (OGDI) enables value creation. To answer the research question and sub questions two strategies have been selected, document- and thematic analysis and semi-structured interviews. To measure whether and how the BDP stimulates OGD use and, thus, value creation, this thesis follows the analytical framework for doing policy analysis on open data policies suggested by Zuiderwijk & Janssen (2014). To answer the two first sub questions – *what are the key objectives of the BDP and what opportunities does the BDP provide public and private sector users?* – the analysis will trace context, environmental conditions and developments present in the implementation and production phase of the programme to capture policy elements characteristic for the specific OGDI under examination.

These elements also include what kind of benefits the programme intends to realise by opening public information following Janssen et al (2012). To answer the subsequent sub-questions – *how and for what purpose is basic data being used by the public and private sector and which value generating mechanism can be traced,*

hence what type of values are produced? – this thesis makes use of the public value framework suggested by Harrison et al. (2012) and the five processes suggested by Davies (2010), including the value proposition framework proposed by Kaasenbrood et al. (2015). The economic value is integrated in the public value framework. The economic value has been elaborated to capture how basic data may be used for commercial reasons and what kind of economic value that creates for private companies.

Since the aim of this thesis is to explore and observe what kind of key factors are necessary to enable value creation through OGD, a coding frame has been developed by synthesising concepts and framework elements suggested by prior literature to analyse OGDI and OGD (re)use (see appendix). The framework also serves as an analytical framework for conducting thematic analysis in order to identify and capture value generating mechanism and values produced using basic data. This analytical strategy enables the study to explore both output and impact of the BDP as well as which key factors are present in both the programme and the actual usage of basic data and how these may be interrelated. Namely, what kind of key factors can be captured expressed tp enable relevant stakeholders to harness the benefit of basic data and what kind of conditions are observable for such stakeholder engagement. As such, the actions and objectives laid out in the programme including intended impact may be closely narrated in the way stakeholder's make use of OGD and why. To answer the research question, the analysis first examines the policy framework and implementation to capture the policy environment, context, input and intended outcomes, i.e., what kind objectives and opportunities does the BDP provide for data consumption. Second, the analysis considers what kind of mechanism and value production are tracible in the use cases and how they may reflect key elements laid out in the policy programme.

3.3. Research quality and limitations

The quality of the study relies on the prior literature review in which appropriate measurements has been established to examine and analyse the quality and processes of OGDIs to facilitate and stimulate OGD (re)use and types of mechanism which may generate certain types of value whether public or economic. In order to construct validity, this thesis has conducted and collected multiple sources of evidence. Furthermore, an audit trail has been made to track the chain of evidence used for data analysis. In addition, a study protocol and guideline were developed for the data collection to create case reliability (cf. Yin, 2018). The main limitation of the study is the sample size which mainly consists of use cases retrieved from government websites, which may expose the data to biased selectivity as these cases have been conducted and selected by the public authority, who governs and distribute basic data, themselves.

Also, due to the timeframe and scope of this thesis, access to key stakeholders has been limited. As such, more enriched data on the private use of basic data was not fully retrieved, which may put limitations on the full validity of the data analysis and findings. Although the study can capture and identify mechanism and factors present in the case necessary to produce certain outcomes, more data is needed to reach sufficient explanation of main variables leading to the use of OGD and hence value creation. However, by conducting an explorative approach, the study can make valid and reliable observations of case specific conditions, which can be used for further cross-case analysis to test whether the findings may be generalisable to other cases and hence which variables best explain OGD usage and impact.

4. Case context and description

To examine whether and how the BDP and basic data generate value creation it is important to consider the context and environment in which the programme was initiated and implemented. The contextual circumstances may implicate certain conditions specific to the Danish case such as the political context and governance structure wherein the BDP has been developed (cf. Zuiderwijk & Janssen, 2014). The following sub-sections look at the policy context and environment of the BDP and describe its initial policy design and processes which have shaped the development of the initiative as well as the policy content (ongoing process). Examining the policy elements and processes present helps to understand which factors and conditions in the Danish case may explain different type of mechanism and outcomes and thereby the societal impact of basic data (OGD). This section is followed by the policy analysis which looks at the process factors which has been identified to affect the stimulation OGD usage and, thus, value creation.

4.1. Danish digital strategy development from 2007-2020

The political structure in Denmark is characterised by a constitutional parliamentary monarchy where the legislative powers is held by a unicameral parliament. Since 2007, Denmark has gone through some fundamental reforms affecting the local government structure which has resulted in 5 regions and 98 municipalities. This has furthermore led to a decentralisation of tasks from the regional to the local level (municipality and re-centralisation of tasks at the state-level). The municipalities are responsible to handle most tasks related to citizen service delivery and the regions are mostly responsible for health care and health care insurance as well as some social affairs aspects, regional development and the coordination of business, tourism, transport and environment (Scupola, 2018 p. 266). One of the characteristics central to the Danish public sector is the high level of decentralisation in which the public administration is divided into three levels as described, state, regions and municipalities. Significant to this structure is the high level of close collaboration through the tasks and legislation adopted by parliament (Scupola, 2018 p. 272).

The ‘Basic Data Program’ has been an integrated part of the common strategy on digitalisation since 2011 (Jetzek, 2015; Scupola, 2018). Prior to the development towards digital information and e-government, Denmark has a long tradition of using IT in the public administration and some of the initiatives dates back to the 1990s and even the 70s (Scupola, 2018). Over the past 20 years, Denmark has implemented five common strategies for public digitalisation which has included all levels of government – which also has given Denmark a leading position internally (Digitaliseringsstyrelsen, 2022b; cf. Scupola, 2018). Furthermore, since 2001 this process has been driven by a close collaboration between state, regions and municipalities with the intention to create solution across the levels of the public sector (Digitaliseringsstyrelsen, 2022b). The introduction of the first strategy in 2001 set out a vision to systematically transform public communication and collaboration, which is still the basic concept behind the Danish approach to e-government. This initiative is considered the beginning of the joint co-operation of digitalising the public administration between the three levels of government. Overall, these initiatives have been drafted at state level and given rise to spin off strategies addressing specific element of the overall strategies (Scupola, 2018 pp. 271-272). Each of the strategies and agendas builds and further develops the goals and objectives of previous schemes (Scupola, 2018 p. 279). As a result of the continuous digitalisation strategy, the basic data programme was developed and has been a highly integrated part of the

overall strategy. The initiative was launched as a part of the 2011-2015 strategy (cf. Scupola, 2018). Following the strategy development, the common strategy for public digitalisations set out guidelines for the public authorities to use a common IT infrastructure and avoid IT 'silos' (Scupola, 2018 p. 279).

4.2. The Basic Data Program – current status and key objectives

In comparison to many other countries, Denmark holds a great amount of public information about citizens and businesses in central registers, which includes CVRs (business register numbers) and CPRs (social security numbers). Furthermore, a long series of other registers of other areas exist which encompass information on property, geography, businesses, addresses and climate. Altogether, this data constitutes public data defined as the basic data of the Danish society. Since 2013, the BDP has functioned to collect all 'basic data' across Danish society and across different sectors with the purpose that both public and private actors can use this data in an efficient manner (SFDE, 2022b). Based on the latest account from the government website, the main objectives underlying the BDP can be summarised as follows: 1) To standardise data, making it possible to combine data from different sources; 2) to provide quality assurance, ensuring data is correct, complete and updated, and 3) to distribute data on a common platform, making data and support available from the same place (SFDE, 2022b). As such, the main driver behind the BDP is that it allows more efficient work processes and better decision-makings through the ability to collect and combine information across different sectors, and that a higher quality of data as well as easier access may enable the private sector to develop new and efficient solutions and products (SFDE, 2022b).

4.3. The Data Distributor – governed by SDFE

From 2018, the basic data (OGD) has been distributed and shared through a platform called the data distributor in which different public data has been made freely available since January 2013, starting with free geodata (SDFE 2022c). The key function of the data distribution platform is to work as a single point of access to basic data, generated from several Danish public authorities, with the intention to serve all parties who may have an interest in using public data. As such, the platform has replaced a series of public distributions solutions and instead made sure that public authorities and companies can make use of an easy and safe access to 'basic data' in one collective system instead of dealing with multiple systems and interfaces (SFDE, 2022d). The main function of the BDP, as mentioned, is the publishing and distribution of open government data produced by various public agencies, which is referred to as 'basic data'. As of now, the SDFE has published several use cases each presenting a story of different users utilising basic data for various purposes and with various outcomes. These use cases include both public and private sector stakeholders from different sectors (SFDE, 2022a). Appendix table 2 shows the full extraction of the sample of cases which provide an overview of users and how they use open government data and for which purposes. The fact that the public agency (SDFE) has chosen to publish these cases, also demonstrates that the government and agency are interested to encourage and stimulate basic data use. By showcasing how other entities whether private or public use OGD and thus generate value, the SDFE encourages others to do the same.

5. Analysis

This section examines the explanatory factors present in 1) the BDP policy framework, including implementation, objectives, collaboration processes, distribution, set-up, current operations, provided opportunities, and related stakeholders, and 2) the use cases, which are considered as embedded units of analysis as they represent the users who (re)utilise basic data.

5.1. Analysis of key elements in the BDP policy framework

Prior to the BDP, the Danish Open Data Innovation Strategy (ODIS) of 2011 emphasised the opportunities open data provides for the development of new products and service innovations (Huijboom & van der Broek, 2011; Jetzek, 2016). In this strategy, the Danish authorities were interested in an increased demand for public services and the potential of public data for innovation and growth (Jetzek, 2016; Huijboom & van der Beck, 2014). Furthermore, in the period prior to the launch and development of the BDP, the Danish public administration already started and underwent a significant digital transformation focusing on making collaborative structures across all government levels with the aim to deliver more coherent and effective public sector services. One of the key priorities in this period was ensuring coherence between IT systems by applying open standards and common requirements (The Danish Government, Local Government Denmark, & Danish Regions, 2007; see also appendix table 1. pp. 66-69).

5.1.1. Policy development and implementation of the BDP

Over the past 10 years of policy development, common strategies of digitalisation have paid significant attention to generating digital public collaboration and acceleration of public sector efficiency, exploiting the position of Denmark as digital frontrunner (The Danish Government, Local Government Denmark, & Danish Regions, 2011; cf. Jetzek 2016). Within this framework, the BDP became important for driving public sector effectiveness and the creation of a foundation for common basic data with the aim to exploit the potential economic benefits from systematic reuse of government data and digital solutions across public authorities (The Danish digital strategy, 2011-2015). In this manner, the BDP was established to drive data development related to the objectives of the common digital strategy (Jetzek, 2015 p. 95). The process of the implementation phase of the BDP was also influenced by two key policy agendas, namely 1) an efficiency driven agenda to reduce waste when data is efficiently used across governments levels, thereby improving the utilisation of digital resources, and 2) an innovation-driven agenda, in which use of data can function as new resource for information, product and services, resulting in the creation of new jobs, businesses and markets, i.e., economic growth (cf. Jetzek, 2016). These policy agendas can also be traced in the various related strategies and initiatives since 2007 up until 2020 (see appendix, table 1. pp. 66-69).

According to Jetzek (2016), the BDP implemented several affordances of open data to enable cross-boundary use of data by multiple stakeholders in the period 2013-2016. Jetzek identified the following influential factors enabling the transformation of open and liquid data, i.e., open government data: affordability and reusability (which relates to open access and data availability – see literature review), interoperability (which relates to technical connectivity – see literature review), usability, including data quality, and discoverability. First, during the implementation phase of the BDP, one of the essential elements to create access to basic data was to make

it affordable, in which basic data was made free. Second, reusability was achieved through public licensing of data. Third, interoperability was achieved by creating a common data model, accommodating a standardised procedure for data registers to model data. Fourth, usability was obtained by designing and implementing a distribution platform via open standard formats, with high data quality that was machine readable. Fifth, the improvement of discoverability was achieved through a single point of access and use of standardised meta-data. The process of implementing open data in the BDP programme, was characterised by multi-stakeholder collaboration among public authorities. Furthermore, the third phase of the implementation of the BDP included a high degree of user involvement to gain important insights in data improvement opportunities (Jetzek, 2016).

5.1.2. Semi-structured interview with the Danish Data authority (SDFE)

Jetzek's findings (2016) regarding key policy agendas, influential factors in the implementation and development of the BDP and the importance of user involvement are corroborated by the Danish public data authority (SDFE). Regarding the policy agenda of the BDP, SDFE highlighted the importance of identified efficiency and economic growth benefits of open data as the main driver for the launch of the BDP programme:

> *"(…) before the agreement was fully established, an extensive pre-analysis had been conducted, in which we looked at how the existing world of processes and systems looked like and how they could be developed in the future. This enabled the different parties to identify some benefits to draft a business case to work as a basis for reaching a political agreement (…) "And then there was a significant element that goes beyond the efficiency gains – and that was the growth agenda that the political [actors] and especially the Ministry of Finance bought into."*

(Chief consultant SDFE: policy benefits of the programme)

According to the SDFE, one of the influential factors in the implementation and development of the BDP, which has now entered its production phase, i.e., the data distributor, is open access and availability of basic data. The authorities bought the rights to relevant data and made it available through public licensing, which reduced entry barriers:

> *"This thing about it [data] being freely available, it is also about more than economics. An issue which also was a result of having to pay for data in the past was that it created some user barriers where you were not able to create solutions across stakeholders unless everyone had the rights agreement. A barrier that has been removed for creating solutions that can create coherence across the municipality, the state and, for that matter, the private sector."*

(Chief consultant SDFE: open access)

Other important factors in the development of the BDP and its current status includes usability and the improvement of data quality. This revolves around getting data that is up to date, which can impact the integration of data processes when used by public authorities and businesses. Per the SDFE:

> *"You can also access via some file accesses – where there also is possibility to be updated on incidents called delta updates. In many cases it is quite essential that you are fully updated [on incidents] in that exact moment when you have to make a business decision – that you have access to the latest data. This mechanism of incident provides opportunities for the integration of processes, and that is one of the ways in which several registers are interconnected – where one registers runs on an incident from another. And then when a change happens in another register, an automatic update is triggered in the first registry. This option is also available for private companies."*

(Chief consultant SDFE: Technical connectivity).

Furthermore, an important part of the BDP and SDFE policy efforts to create conditions for reducing user complexity is increasing interconnectivity, which includes interoperability and discoverability. For example, ensuring standardisation of data formats and documentation, resulting in a common data model for users. This gives users the opportunity to see how data is interconnected and to find the original source:

> *"A big part of what we have worked on has been interconnection. And in order to create interconnection, in addition to looking at processes and systems both in general and in detail, we also looked at standards and documentation of the data model for users. We have a common basic data model, which is quite significant for the users. Here you can click around and see how the interconnection works and what kind of information there is in each domain with a reference – and then you have a total documentation of the service provided on the data distributor where you can read more in depth."*
>
> (Chief consultant SDFE: technical connectivity).

Via the data distributor platform governed by SDFE, users can receive technical support and provide feedback. Furthermore, SDFE is in continuous structured dialogue with key stakeholders:

> *"We have technical support which provides significant input to us both in terms of how the service is provided, how the data looks like, and how the documentation is covered. Then we have dialogues structured to a varying degree. There are some of these big sector stakeholders that we meet with in regular intervals - both at management level but also at operational level. Some of them frequently as well"*
>
> (Chief consultant SDFE: technical support and feedback mechanisms).

The process of creating interconnectivity has also been followed by efforts to create more uniformity among the different registers that provide basic data, leading to a reduction of technical barriers. However, this is still an element that requires ongoing work as some registers still have autonomous ways of working. Furthermore, even though the authorities have worked on standardisation and accessibility, it is still quite complex to make use of basic data. As such, the data authority is currently working on the future strategic framework plan to address how future developments can be improved, changed and sustained. A process which has encompassed and still involves a high degree of user involvement (see SDFE interview appendix p. 51-52).

Another important factor which is especially characteristic, now that the programme has entered the production phase, is the established data governance which involves major key stakeholder representing both the public and private sector. This governance also includes a user forum of major key stakeholders and sectors who make use of basic data. Among those are the IT-sector, utility sector and parties making use of geodata, and a private stakeholder representing the IT network for main stakeholders in the financial sector (see SDFE interview appendix p. 49).

The attention to basic data users and how basic data creates values is showcased by the examples of user involvement and events hosted to have examples of sectors and stakeholder's who have benefited from integrating basic data in their business. Though the focus on value generation was already evident during the implementation phase of the BDP (Jetzek, 2016), this focus area has continued to be a significant element in which the authorities investigate how basic data creates value for users (see also appendix: table 1.). Here, the

technical platform and the output of quality data have played a significant role for users who have made an investment building their service on basic data.

> *"It was a public event that we held together with e-nettet and the Geodata Board, where we talked about the use of basic data in the financial sector. And they have kind of put all their eggs in the basic data basket and made themselves dependent on the infrastructure that is built around basic data and the way [data] is made available. (…) they've made themselves dependent because it gives them significant value (…) It involves the process in which they receive improved data and in better quality and that it [data] is made available via a technical platform – and with the technical support it has really been really improved in a way they have not experienced before. They get a more professional approach to public data. And ultimately, it means they can have more efficient systems and processes and it saves them some costs. They have made huge investments and realising significant benefits."*
>
> (Chief consultant SDFE: data quality, technical connectivity and technical support).

The key points which can be corroborated from the policy tracing, the study of Jetzek (2016) and the interview with SDFE, is the great policy effort to create a sound technical infrastructure, i.e., the data distributor, which has paid significant attention to ensure and continuously improve a high quality of data across boundaries and dimensions of data availability and usability (cf. Jetzek, 2016; SDFE interview). A focus area which likewise has been an ongoing process since 2016 and forward (see appendix: table 1). Furthermore, the setup of stakeholder engagement and feedback mechanism have also been central to continuous maintaining and improving data quality which reflects on the distribution process.

As described by the SDFE, the ability to tap into the knowledge of the users also enable the data authority to work more intelligently with data (see SDFE interview appendix pp.55-56). Having a solid data foundation, as narrated by the SFDE, also goes beyond the political interest in the growth agenda because it creates a common reference frame and incentive for the public sector to make data available, which in turn leads to continuous data improvement, and thus a more efficient public administration (see SDFE interview appendix pp. 55-56). According to study of Jetzek (2016), the strong focus on internal gains was quite essential to gaining long-term funding and political support to secure the sustainability of the BDP (Jetzek, 2016, pp. 101-102). Ensuring sustainability in data provision is also highly important if private entities are to continue using OGD, as they depend on consistency and valid data (cf. Jetzek, 2016). However, the public sector incentive does not stand alone.

The emphasis on how basic data creates value for users both private and public has been, and continues to be, a central focus area for the Danish data authority. Per the SDFE, collaboration between public and private sector bears potential value as it may contribute to solve some societal challenges in the future. This presumes new ways of thinking across the public and private sector in which basic data can make great contribute as it provides a common foundation (see SDFE interview appendix pp. 55-56). As such, the attention to societal impact and 'value for users' continues to be central to the distribution and provision scheme. This point is also ascribed as fundamental by Jetzek (2016), who proposed that the motivational factors (both the internal gains and growth agenda) played a large role in the programme success, namely the shift to focus on the value generation of open data – a focus area which has been suggested to lack in other initiatives (Jetzek, 2016 p. 102).

In sum, the policy framework of the BDP, and now, the data distributor, shows key factors which are disclosed to be essential for data uptake such as data availability and accessibility, data usability and quality and indeed the establishment of technical connectivity (interconnectivity), which create the foundation for providing and distributing basic data (OGD) of use to the public and private sector. Furthermore, the BDP implementation process as well as its production phase has been characterised by multi-stakeholder involvement and attention to impact, which is also suggested by literature as important factors necessary for data uptake.

5.2. Public and private sector (re)use of basic data

This sub-section provides an analysis of the embedded use cased, what types of values are created, what kind of mechanism are observable and what key factors are narrated as influencing or enabling the use of basic data as well as the added value it generates. The sample of embedded use cases show that most of the cases related to public sector use of basic data illustrates a high degree of internal gains of making basic data available, which was one of the original aims: “creating common basic data for a more efficient public administration” (The Danish digital strategy, 2011-2015, see appendix table 1). However, in line with the aim to create opportunities for commercial exploitation of basic data, the use cases also highlight examples of private sector use, which was corroborated by an interview with Boliga Group and government website articles on two other stakeholders, disclosed through desktop research. This sub-section first consider public sector use of basic data after which private sector usage is analysed.

5.2.1. Mechanism of basic data in public use-cases and its impact on the public value dimensions

When examining the sample of use cases on public sector use of basic data, output of creating better public service delivery in terms of more transparent, participatory, effective and efficient case handling and/or performance of public tasks, producing strategic value and quality of life, are the most dominant themes. These themes are found in four cases. The first case is the municipality of Hjørring who created a public service delivery platform, named ‘the planner’, which informs both citizens and civil servants on the eligibility for public transport subsidies for children. Using geodata (OGD) as an integrated part of the planner enabled stakeholders to calculate the route to school, including safety risks. Based on the planner parents can see the specific data, which determines whether their children are eligible for public transport subsidies. As such, the planner created a transparent framework for decision-making, hence, ensuring more efficient and transparent public administration. Furthermore, the local authorities have already estimated that 90% fewer complaints have been lodged. The result is the generation of strategic value, which creates both economic and political advantages for public decision-making (see appendix table 2. p. 74).

The second case concerns the municipality of Odense who developed an interactive mobile application to make it easier for civil servants and citizens to address and handle future climate change. The application uses, among others, geodata in combination with augmented reality technology to enable users to screen an area for expected rainfall and water levels, allowing stakeholders to plan. This is an example of a participatory mechanism, producing strategic value for planning and prepare for climate adaption, which generates quality of life for citizens, who may avoid negative climate effects (see appendix table 2. pp. 72-73). The third case relates to the Danish Ministry of Internal Affairs who use basic data derived from the citizen service number registry, including

addresses, to enable more efficient planning of local elections. To facilitate planning, SDFE developed an application where municipalities could submit voting areas divided into geographical polygons to a relevant register. This enabled the authorities to link different OGD to ensure that the voting letters were sent to the addresses in connection to the accurate electoral location. This process was previously done manually. The new approach resulted in a more effective and efficient way to plan elections, creating a strategic value for the public administration (see appendix table 2. pp. 76-77).

The fourth case pertains the Danish Ministry of Defence Acquisition and Logistics Organisation (DALO) who make use of the distribution of basic data as a necessary element to solve public defence tasks. More specific, DALO uses geodata to map out defence territories, which is essential when cooperating with international partners. Here, DALO ensures that the defence has high quality maps at its disposal. This can be construed as an example of a mechanism of efficiency and effectiveness, which produce strategic value in public service delivery (see appendix table 2. pp. 77-78).

In sum, the public values most significant were strategic value and quality of life in which local and state authorities could either enhance public service delivery which had impact on both civil servants and citizenry to make decisions or for state authorities to make better use of internal resources to execute and perform public tasks. The value of quality of life were close realtered to climate adaption and creating tools and mechanism for citizens and public authorities to take measurements to prevent flood or damage. In the cases which related to more smooth and transparent case handling based on basic data, one can also consider the value of stewardship in which decisions are based on factual measurements available for citizen scrutiny and thus the public accountability. These values were highly driven by the mechanism of efficiency, effectiveness, participation and collaboration. The next paragraphs examine key factors expressed as influential for public service value generation through basic data (OGD).

5.2.2. Key-factors which are expressed to enable OGD (re)use and value creation

In the analysis of the public service use cases, most examples concentrated on public value mechanisms and less on the actual enabling factors. However, in most cases it was implicitly evident that having access to basic data (OGD) across government levels was the main contribution for (re)using this open data. One example in which it was clearly stated was in the case of the municipality of Jammerbugt, which stated that the project of developing artificial intelligence to model and predict floods in the future was mainly possible due to open access to various public data sets (see appendix table 2. p 73). In other cases, the aspect of having a well-grounded technical infrastructure or technical connectivity was transparent due to the reference of having the possibility to use basic data as a foundation for public administration created immense value, such as was the case with ‘the planner’ and the case of the Ministry of Internal Affairs, as mentioned in the previous paragraphs. Data quality was also stated as an important factor for OGD use and value creation because it enables public authorities to base their decision-making and service delivery on a reliable framework, as can be seen in the two cases of Halsnæs municipality (see appendix table 2. pp. 74-76).

In sum, accessibility in terms of open access to free data, and data quality in terms of the ability to link and combine data and having access to proper and valid data were the main key factors observable for public authorities in the use cases which enabled (re)use and value generation from basic data (OGD). Second to that,

the use cases also expressed different processed characteristic to the notion of technical connectivity. However, this conceptual notion was mostly related to the technology or digital tools which was set up to further convey basic data into interfaces for secondary use. For an example, the application launched by the Odense municipality and water reference created by the SDFE to enable other authority to perform environmental supervision (see appendix table 2. pp. 72-73). As such, this category could be revised to concern the role of infomediaries in which third party enable next line use of basic data (cf., Ubaldi, 2013; Janssen and Zuiderwijk, 2014). Last, the cases also Another factor which was not directly derived from the theoretical framework was the notion of basic data as a common foundation to deliver and perform public tasks, which reflect the policy aim to create an interconnectivity and coherence in which basic data contributes to the very foundation of creating cohesive public administration across boundaries and domains.

5.2.3. Value generating processes and practices in private use cases – commercialisation of basic data'

Considering the sample of use cases on private sector utilisation of basic data, output of economic growth and innovation in terms of commercialisation of basic data (OGD). These themes were found in four use cases. The first use case pertains to the process of transforming data into services by an IT company called Datalogisk who use basic data, i.e., orthophotos (maps). They provide software that integrates orthophotos in combination with geodata and other basic data, such as addresses and cadastral maps, to help farmers gain a visual overview of their fields, which aids them in agricultural production (see appendix p. 69). This is an example of basic data generating economic value in which the integration of OGD provides business a competitive advantage to improve their services and products. The second use case relates to a consulting firm called SWECO. SWECO provides a management system which collects various information and data, including basic data, needed to execute public environmental supervision. The system is used by public authorities like municipalities. This is an example of a private sector service enabling end users to access a broad range of relevant data sets needed to perform public tasks in an effective manner (see appendix table 2. p. 70). As such, this can be understood as an instance of data-to-data and data-to-service as is explained in the framework of Davies (2010).

The third use case concerns E-nettet, which is a cooperative company providing, among others, IT infrastructure services, and is owned by Danish financial sector institutions. E-nettet uses basic data (OGD) to provide digital solutions, such as property valuation (see appendix table 2. p. 71). They link data together so that their customers can optimise business processes. This is an example of data-to-service in which data works behind the scenes, enabling certain services (Davies, 2010). In corroboration with the Danish Data authority, e-nettet has made their service totally dependent on basic data as thy provide digital infrastructure for the financial sector – bank, credit and mortgage institutions (e-nettet, 2022 para. 3, 9, 11). Their service provides data on person, addresses and properties which is quite essential when doing correct property valuation and making credit assessment for house mortgages (e-nettet, 2022). As such, by having access to an infrastructure like this, creates very tangible benefits for the banks and real credit institutions when guiding and assessing their customers (e-nettet, 2022 para. 6).

The fourth case relates to Boliga Group, who is one of the largest users of basic data provided by SDFE. They provide a website that uses different forms of basic data to make searching for housing properties more transparent. The use of background maps and geodata enable website visitors to view houses in terms of, among

others, location, distances and leisure areas (see appendix table 2. pp. 69-70). This is an example of different processes, including data-to-service, data-to-information, data to data, and data-to-interface (Davies, 2010). The case of Boliga was furthermore elaborated by an interview with product owner of dingeo.dk which is a subbranch of the Boliga Group. The significant element in their use of basic data was that despite being able to build a business model behind the website in terms of advertising and doing business partnerships, is that it was developed by a hobby programmer who were looking for relevant data searching for housing property himself. As such, he crawled all the data for the various data sources where other house seekers could access all relevant data via one single entry point in a comprehensible and easy way.

> *"(…) you could say the whole business idea, at least with DinGeo, is based on open basic data. So without them, no DinGeo. That is one place to start. So that is the very foundation. And it's kind of fact, that there's an incredible amount of data, but it can be hard to find if you're just an ordinary citizen in this country – "where do I look for these datasets?". Have you ever heard of the Danish Environmental Portal or the radar study from 2001 or something like that. You would have to be a bit of a geek (…) And then what we say – we really want to make it easily accessible. That is the service we offer, so to speak. And we know something about this information which is hard to grasp, and we can convey that into an easy understandable format."*
>
> (Product owner, dingeo.dk – data to service, data capabilities).
>
> *"We provide a free service to end-users where you can enter an address and then you can get some information about that address. And that's kind of what we provide to end-users. Then of course you may be in the situation where you want to look up more addresses. You might be an insurance company that wants to know about flood risk and so you might want to look up your entire customer base or potential customers or whatever it might be. And then all of a sudden it might be a hundred thousand addresses you need to investigate. So here we have a B2B business model running behind it all and so you could say that for that part our website becomes a showcase of data available"*
>
> (Product owner, dingeo.dk – data-to- service – data-to-interface/information – data-to-data).

On that account dingeo.dk is mainly based on data from basic data innovating a new site for house seekers to make property assessment from various open data sources. Here, the value proposition is to create a more balanced and transparent market in which you not only brows the address but can make use of different data sources to identify flood risk or shadows on land plot which might influence the decision to purchase a property or not. Despite the realisation of profit turnover, which was estimated for dinge.dk to be between 2-3 million DKK, the website also makes basic data valuable to end-users who can access open data free of charge. In that way dingeo.dk contributing to create a more levelled playing field for buying property by transforming basic data into a common good.

> *"And it kind of goes for both sides – that we create a level playing field so that nobody gets ripped off and nobody buys a place that was not really what they wanted in the first place. Because what they really wanted originally was a place isolated from noise, but that was not really the experience when they saw the property because they went on a Sunday and did not experience the traffic of Monday morning. And in this case, we can provide some information which indicate: "maybe you also should make a viewing Monday morning or in November on a rainy day". So hopefully, for the societal gain, more people do not make a miss purchase of property."*
>
> (Product owner, dingeo.dk – value proposition and social impact beyond commercial interest).

In sum, the most significant process in the commercialisation of OGD was data to service as most of the cases made use of basic data to enhance or provide online functional service. In one case to create competitive advantage. Two of the other cases gained added value making use of free basic data which created significant cost saving. The two cases, where basic data had the most significant impact were e-nettet and Boliga Group. Both services were highly dependent on making use of basic data as an integrated part of their service delivery. Dingeo.dk was a great example of a case in which a hobby programmer had made innovation of basic data and turned it into a business with great value for house seekers to make more sound decision when search and buying house property.

5.2.4. Key factors expressed as influential for the integration of OGD in business processes

One of the most significant factors expressed in the private use cases was the open access to free basic data. For example, in the case of Datalogisk, the accessibility to free and open government data made it possible for the company to provide and improve a more competitive product.

> *“It is a great service that the government make a large part of the data that we use available and for free. And it makes our product in Denmark far better than abroad, where there are no similar schemes”*
>
> (CEO at Datalogisk, table 2. pp. 69)

This factor was also expressed by the CEO of Boliga Group who also emphasised the added value of having access to free basic data, which resulted in a significant cost reduction because they were not dependent on private data suppliers (see appendix table 2 pp. 69-70). In addition, SWECO pointed to the importance of having a standardised entry point to access data. This created an easier manner for them to improve their product when various data is gathered in one place (see appendix table 2. p.70-71).

> *"If we didn't have free and unified access to basic data, it would be more expensive for us to develop MiljøWeb, as individual solutions would have to be found for each data set. But that's what you can do in Denmark, make open cross-cutting solutions."*
>
> (Project manager at SWECO, table 2. p. 70-71)

In sum, accessibility, affordability and open access were the most important factors found for businesses to use and generate value from basic data (OGD). However, in terms of data usability and quality, the interview from dingeo.dk also revealed that data quality has a great impact on the service delivery output when integrating data from public data platforms. This also included the access to valid documentation of the interconnectivity of the data such as what type of data it is, the background behind it and the calculations behind the data. What they have experiences was that there has not been published a whole new set of public data, but instead there had been a process of improvement and providing a better data quality of the data made available (see interview dingeo.dk appendix pp. 62). The product owner also expressed that they have a good dialogue with the data authority’s technical support based on genuine interest in their use of basic data and positive support. Also, that the relationship with the data provider led to good discussions on error incidents, data interpretation, and how to best solve issues (see interview dingeo.dk appendix pp. 62-63).

The aspect of accurate and timely data was also present in an article published by the IT-service provider e-nettet (e-nettet, 2022). Like Boliga, e-nettet also deliver services based on data about housing (BBR). When providing digital solutions that are supposed to ensure the data necessary to obtain mortgages, it is important to have a good grip on the various data sources. When the banks and real credit institutions need to identify a person or an address it is necessary to have a reliable foundation to ensure you are at valuating the right person and property (e-nettet, 2022 para. 1-3). As such, it is crucial that one can retrieve data that is valid and accurate also in order to secure a holistic picture and optimise business processes.

> *"It is important for us that we can trust data. And in relation to being able to optimize processes and have an overall overview, it is important that data is gathered in one place (…) The more digital access, the easier it will be to serve customers - which is an advantage for all parties."*
>
> (e-nettet, 2022 para. 6 – head of department Nordea Kredit).

Also, by having comprehensive access to important data which can document tax information and property information enables to make secure basis for correct property assessment (e-nettet, 2022 para. 11).

In this regard the partnership and close collaboration with SDFE is fundamental to e-nettet: "

> *"The e-network works to ensure a good data base for the financial sector, real estate agents and lawyers, and here it is crucial to have access to updated quality data in the form of Basic Data, which the e-network enriches with other data. The e-network continuously ensures the quality of basic data in close collaboration with the Danish Agency for Data Supply and Efficiency (SDFE)"*
>
> (e-nettet, 2022 para.10).

In terms of cost of reduction, availability and quality is stated to be a prerequisite for an efficient and effective case handling process in the financial sector. The automatic data supply saves the sector 10 million DKK every month (e-nettet, 2022 para.15-16 - CEO). By having a common foundation to access data via e-nettet creates great value for the sector collectively and is also estimated to have value for customer satisfaction due to more effective case handling (e-nettet, 2022).

In sum, the most significant motivational and influential factors present in the private sector use cases were the open access to free data and data quality in terms of reliability, accuracy and timeliness. Especially, the case of e-nettet revealed the importance of the interconnects between data availability and data quality – a relationship which was also disclosed from the literature. On this background, the policy aims to create interconnectivity and coherence to have wide impact not only on private sector efficiency but also for the business community can be traced in the actual use of basic data and how private companies convey this data into their business process. The cases shows that basic data is being used for commercial reasons which either enhanced competitiveness or optimised businesses processes. However, the use cases also revealed societal impact in which business opportunities was not the only incentive to make use of basic data. The ability to be able to make use of accurate and high-quality data free of charge made a difference for why the private actors made use of basic data. Also, the private sector users also mentioned basic data as a foundation for developing services of value, which also relates back to the authorities' objective to create common framework creating value across boundaries and sectors.

6. Conclusion

6.1. Outcome

This thesis examined whether the Basic Data Programme enables value creation in the Danish public and private sectors, and if so, how it enables value creation. It did this through part literature analysis, policy analysis, and a study of relevant use cases, articles and semi-structured interviews. The thesis found that the BDP enables value creation for the Danish public and private sectors. It does this by providing basic data, i.e., open government data, through a common data distribution platform, which offers access to various types of data collected from a wide range of public registers. However, as examined, only providing access to OGD is not enough (e.g. Janssen et al., 2012). Value creation can only be realised if OGD is being used by relevant stakeholders in a manner that is of added value. The academic literature suggests that certain key factors need to be present to stimulate OGD use and therefore value creation. This requires a closer look at how policies and OGDIs set up certain goals and objectives to drive their data regime (e.g. Janssen et al., 2012; Jetzek et al., 2014; Attard et al, 2015). Key factors in stimulating OGD use include making data available and accessible in a standardised manner, e.g., in machine readable formats, open licensing, enabling free use of data, and data findability concerning the traceability of data sources, data usability and quality which concerns whether data is interoperable, e.g., whether data is accurate, complete, timeliness and standardised. Furthermore, feedback mechanisms and user interaction with government are also considered as influential factors along with technical connectivity and capability.

A policy analysis showed that the main objective of the BDP has been to provide high quality OGD to enable its (re)use across different sectors and by various stakeholders, including individuals, public sector actors as well as businesses. As such, the BDP has been driven by a focus on impact concerning public sector efficiency and economic growth (e.g. Zuiderwijk & Janssen, 2014). Furthermore, the implementation phase of the BDP resulted in key elements, which enabled cross-boundary use of data, among these were data interoperability, (re)usability, and affordability. These concepts overlap in attributes with the concepts disclosed in the literature review. Especially the effort to create and establish a common platform (data infrastructure) has been a central focus in the policy framework of the BDP. The interview with the Danish data authority (SDFE) also highlighted an intensive effort to create high quality data. Another significant factor has been the work to increase data interconnectivity, interoperability and discoverability. Especially by ensuring standardisation of data formats and documentation, resulting in a common model for users. Furthermore, the SDFE also offers technical support and feedback mechanisms as part of the data distribution platform. Another important factor characteristic of the current BDP framework is the high focus of stakeholder involvement, which also includes the establishment of governance in which both public and private stakeholders are represented. A significant finding from the policy analysis is that the BDP has a strong policy focus on how OGD can provide value for users. In sum, the policy framework of the BDP reveals important key factors necessary for stimulating OGD use. These factors have created a common foundation for providing and distributing OGD under the BDP.

The analysis of use cases, articles and interviews found that OGD made available through the BDP is used in different manners, including private sector development of software using geodata, efficient public sector service delivery regarding electoral planning, and public sector climate adaption efforts. The analysis found that

several value generating mechanisms for creating various types of values were present. In the private sector these include data-to-service, data-to-information, data-to-data, and data-to-interface processes. Especially data-to-service meaning that OGD was significantly used as integrated part for delivering digital services and solutions. For the public sector, value generating mechanisms included efficiency, effectiveness, participation and collaboration. The most significant value created was strategic value and quality of life. These values were especially present in the cases dealing with climate adaptation. In general, the strategic value was high across all levels of government in which both local and state authorities were able to make use of data as an added resource to perform public tasks. Furthermore, examining the use cases revealed certain explanatory factors for stakeholders to generate value from OGD.

For public sector stakeholders these were data accessibility in terms of open access to free data, and data quality in terms of linking and combining data as well as having access to valid data. Also, technical connectivity and interconnectivity were found to have significant resonance. However, technical connectivity may also be related to the way public sector stakeholders adopted new technology to further convey basic data for citizen use. As such, these stakeholders may be considered as infomediaries between OGD made available on the BDP platform and the reuse by citizens. For private sector stakeholders, the main factors which were expressed as significant were open access to free data and the high quality of data, including standardisation, accuracy and timeliness. This was especially significant in the case of e-nettet. Here, the whole setup providing digital infrastructure to the financial sector is highly dependent on the interconnection between data availability and data quality. Finally, stakeholder engagement, collaboration and user interaction with data providers, i.e., SDFE, were expressed both by the Danish data authority, public and private stakeholders which in the literature also is expressed as essential for value generation using OGD (cf. Ubaldi, 2013).

When comparing the policy analysis and the actual use of basic data (OGD), it is evident that the affordances and conditions laid out in the BDP, and distribution framework resonates in the use cases. This may explain why the BDP and its data distribution platform enables data uptake by third parties. Also, the two approaches and impact objectives have been achieved as both public sector stakeholders and private stakeholders make use of basic data. The comparison of the BDP policy framework and data distribution and provision regime, thus, illuminate that factors and dimensions are contingent in the basic data uptake. Especially, the factors of open access (free license) and data quality – specifically in terms of data reliability – are stated as important elements for users to make use of basic data, and thus, generate and add value to their products, processes and/or service delivery. As such, the BDP is an example of an OGDI which provides an infrastructure that enables OGD use and value generation by third party users (cf. Jetzek et al., 2014). Still, a large part of the published use cases solely represents the public sector. Therefore, more attention could be paid to how and why basic data is used by the private sector An interesting point to finalise the conclusion with, is that the future framework of the basic data is considering looking into public/private partnerships and eco-systems to enable co-creation for solving societal challenges in which basic data potentially could lay the foundation (see appendix table 1. and SDFE interview p. xx).

6.2. Discussion

The case studies contribute to the literature by examinining the actual impact of OGD and how it relates to an OGDI policy framework – in this thesis the BDP. Furthermore, the thesis provides empirical insights into how

and why OGD is being used by public and private stakeholders. In addition, the analysis considers important factors expressed by OGD users in the success of an OGDI, as well as any value generating mechanisms present. However, it is important to note that the Danish case has several unique conditions. For example, prior to the BDP programme, the Danish public sector was already highly digitalised and interconnected, which may not be the case in other countries. Also, the implementation process was highly characterised by cross-collaboration between public authorities, which may explain the success of creating an accessible and usable OGD platform. In addition, the centralised registers present in Denmark may also explain the ability to create strong coherence across public boundaries and domains, which is, e.g., important for standardisation purposes. The study was able to observe and identify relevant factors (variables) present in the case. Factors which as per prior literature are ascribed to have influence on stimulating OGD use and thus, value creation.

Further research should focus on creating more conceptual clarity to better measure the interrelation and correlation between OGD provision (data availability and accessibility) and OGD reutilisation (data usability and quality) as these are fragmented in the literature and overlap in definitions and attributes. Yet, since OGD is highly heterogonous and context dependent (cf. Janssen et el, 2012) more case studies should be carried out to make cross comparative analysis possible and to explore and potentially explain the main variables involved in producing certain outcomes and impact. Another aspect which needs more attention is the exact type of stakeholder and their position in the OGD value chain as these may act as important infomediaries for citizens to make use of OGD (Ubaldi, 2013; Janssen & Zuiderwijk, 2014). One of the limitations of this research was the limited access to OGD stakeholders. This limited the scope and made it difficult to capture not only necessary conditions but also barriers to use basic data. As such, for further research purposes, more in-depth knowledge and a bigger sample size are needed. Furthermore, the fact the use cases were published by the SDFE, who governs data distribution, may have created selection bias in the results. On the other hand, the sample does reflect the main users of basic data and SDFE services.

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Appendix

1. Interview guides

Interview guide 1:

Danish Agency for Data distribution and efficiency (SDFE) – Chief Consultant for the use of basic data

Outline and consent

Brief presentation of project, purpose of interview and approval to record, possibility of anonymisation and that this thesis will be available via Leiden's portal.

Introductory questions:

Can you briefly describe your role in the Agency for Data Supply and Efficiency?

Can you start by briefly explaining what the basic data programme is about and what service you provide for relevant stakeholders (i.e. users)?

Theme 1: Basic data and the data provider (content and service)

Development of the programme since its launch in 2016 and up to today?

What data is published and how is it accessed?

Metadata and standards ? Ongoing updates ?

Policy objectives for the future of basic data ?

Theme 2: Which audiences (who)

Who uses public basic data?

What measures have you implemented to monitor the use of public basic data?

How do you communicate with end-users?

What feedback have you received from end-users? How do you use that feedback?

Theme 3: Use of basic data (why and how)

How do end-users use basic public data and for what purposes?

Can you describe examples (best-practice) where an end-user has used public basic data (how and why they use public basic data and with what result?)

Theme 4: What is the value of using public basic data (meaning/impact)?

Overall, as a public authority and provider, how do you think public sector data can create value for society? (societal value)

What opportunities/benefits, according to you as a public authority, are there in the use of public basic data for Danish companies and other relevant stakeholders?

What economic benefits do you expect the use of public basic data to generate (and how)?

Concluding questions:

Do you have any data yourself on how many people use basic data e.g. how many down-loads per month and which basic data are most used?

Do you have any elaborating comments here at the fall that could be relevant? E.g. in terms of who uses basic data and why?

Do you have any questions for me?

Interview guide 2:

Private company – Dingeo.dk/Boliga.dk

Outline and consent

Brief presentation of project, purpose of interview and approval to record, possibility of anonymisation and that this thesis will be available via Leiden's portal.

Preliminary questions:

Could you please briefly describe your company profile?

Can you briefly describe your role/function in the company/organisation?

Can you start by briefly explaining; why and how you/you work with data in general?

Theme 1 Reasons for application:

When did you start using basic public data?

Can you tell me why you decided to integrate or use public data in your company?

How would you evaluate the "basic data" provided by the data provider/SDFE? For example, how would you describe their usefulness in terms of availability, quality, format, possibility to combine them with other data, etc.?

Possibly. Can you describe how authorities have worked to expose basic data - before and after the implementation of the 'basic data programme'?

Theme 2 Use/purpose/economic value:

Can you describe in general terms how you use public basic data?

In what way is the use of public basic data integrated in your company/business model? (elaborate).

What is your main purpose in using/applying public sector data?

What are the benefits of public basic data and what do you/they consider to be the main benefits of using public basic data?

What (economic) value does the use of public basic data have for your company?

**in terms of how the use of basic data contributes to the company's or organisation's workflows/business model and/or product/services *improvement of existing products/services or products and/or direct basis for development of (new) products and/or services?*

What is the value for the end-user?

Theme 3 motivation/impediments/barriers:

What is your experience with using basic data via the data distributor or SDFE? For example, in terms of data quality, formats, and how well they can be linked to other data. (data usability)

Possibly. Before and after basic data was made available free of charge.

Have you used any of the communication channels available in terms of use and continuous updates? If yes, how do you use these channels?

How would you evaluate the support provided by the data authorities (SDFE)?

Concluding

Do you have any elaborating comments here at the fall that could be relevant?

Do you have any questions for me?

2. Interview transcription

Interview - Chief consultant for use of basic data (SFDE)

Lea: Can you briefly describe your role within the Agency for Data Supply and Efficiency and then explain in broad terms what the Basic Data Programme is all about?

P.: Can you just repeat the first question?

Lea: What your profession or role is?

P.: Well, what is it called, I am the chief consultant for SDFE in a department called data supported management where we have the regulatory responsibility for basic data. And that's a responsibility we took over from the digitisation board when the basic data programme was completed and we went live with basic data - and then we established a joint governance around basic data in production, which is supported by our office. And also other offices, because there are some different forums in that governance. But we may get into that later.

So yes, my job is to support that governance together with some colleagues and talk to the key users and their [basic data] usage and support them. And then I have history that goes back to the birth of the basic data program, where I had different roles in the pre-analysis and implementation processes. I was the project manager and in the final phase sub-program manager on what is called the property data program.

Lea: So you've been there from the implementation, which I've also read, there's been some research around, and so I'd like to ask if you can explain broadly what the basic data programme is actually about and what service it is you provide to relevant stakeholders and/or actors?

P.: The basic data programme was adopted, or decided on, during a previous strategy on digitalisation – and is, you could say, a co-operative programme between the government, i.e. the state, the regions and the municipalities. And, before the agreement was fully established, an extensive pre-analysis had been conducted, in which we looked at how the existing world of processes and systems looked like and how they could be developed in the future. This enabled the different parties to identify some benefits to draft a business case to work as a basis for reaching a political agreement grounded in the reality – and where there was agreement on a common vision. And that was through the re-use of data and through the ability to register data in one place and then re-use that data in another place. In that way some workflows could be reduced, particularly in the municipality, but also at the state level and also for some private players who deals with [data] updating. And, one was able to produce higher data quality and achieve greater consistency across data.

And then there was a significant element that went beyond the efficiency gains – and that was the growth agenda that especially the political [actors] and especially the Ministry of Finance bought into – as a significant element – where public registers were redeemed that previously charged fees [for data retrieval]. The first thing that happened in the basic data programme was that some public registers were bought out to free up costs [on data].

What is now available – which is finalised – is a coherent management of registers and it gives some advantages to register authorities – in which you could say that instead of dealing with for example address

registration in the CPR – this can be done by another register authority and then they can use that registration in their register management. And yes, the municipalities, they have a more efficient workflow and there have also been some cost reductions on IT-development and maintenance for various parties in the municipal and at the state level.

And then, there is the whole user-side who are also the same - what can you say, municipalities and state agencies are also users - but in addition there is a wide range of other public users and [data] application contexts. And some private ones, and yes they have free access, it's not chargeable, and they get access to high quality data in a wider context. And in addition, as part of the basic data programme, many millions of DKK, and many man-hours, were invested, and the quality of a wide range of data was improved. One cleaned (interrupted sound). There were a lot of hands involved, municipal case-handlers were involved to raise the quality, but we also did some machine exercises.

This thing about it [data] being freely available, it's also about more than economics. An issue which also was a result of having to pay for data in the past was that it created some user barriers where you were not able to create solutions across stakeholders unless everyone had the rights to access. A barrier that has been removed for creating solutions that can create coherence across the municipality, the state and, for that matter, the private sector.

Lea: I'd like to dive into that, because it's also about the development of applications, because it was finalised as far as I understand in 2016, with some of the first data, and then it's been in development continuously?

P.: Well an agreement was made in 2012 – and then the implementation started and well from there it has been a long and difficult implementation process where some postponements were made along the way with additional funding. And then the implementation was finalised in 2019. And we went live in 2020. There are some documents from the finance committee that you can dive into. I have found some documents. Here is the most recent document. I'll post a link here in the chat, so you have the option to download it. It tells a bit about the history and the figures that we have on profit realisation.

Lea: That sounds really interesting, I would like to read that. It's also something that I would like to explore also in the extension of why the decision was made to open up public data 1) that there was an efficiency gain, where you can work across authorities, that you can access data in an easy and good way, 2) it's also something that has been discussed in other countries, the Obama initiative, the European data strategy and also early in the Danish digitisation strategy. And then there has been talk about what data can do and why it is a good idea to open up public data.

Now we've talked a bit about this licensing - this thing about data being freely available, that you don't have to pay for it. I've read that you can have a subscription scheme, for example, in relation to continuous updating and incident history, that is, if there are continuous changes. Is that free? Is that a way of accessing data?

P.: It's free. It's a technical method that requires that you are known by the system – otherwise it can't be done.

Lea: I guess it's also a way to create quality, so if you as a user or a company are always getting the latest data - I guess that also helps to avoid errors in the data and to be constantly updated if there are changes?

P.: Yes, you can access [data] in different technical ways. One way is via an subscription to [data] incidents which can be combined with web service calls. You can also access via some file accesses – where there also is possibility to be updated on incidents called delta updates. In many cases it is quite essential that you are fully updated [on incidents] in that exact moment when you have to make a business decision – that you have access to the latest data. This mechanism of incident provides opportunities for the integration of processes, and that is one of the ways in which several registers are interconnected – where one registers runs on an incident from another. And then when a change happens in another register, an automatic update is triggered in the first registry. This option is also available for private companies. I don't think that this quite common, but there is a possibility of making integration where an incident in public data management can trigger that you do something in your business. For example, if someone moves, you might have to deal with that in a customer relationship.

Lea: then I would like to ask about the content, e.g. metadata, standards - is there anything here that makes the Danish data programme particularly high quality in terms of whether you can access it, where does the data come from, what does it represent and how can you use it? Can you tell me something about that?

P.: Yes a big part of what we have worked on has been to create coherence. And in order to create coherence, in addition to looking at processes and systems both in general and in detail, we also looked at standards and documentation of the data model for users. We have a common basic data model, which is quite significant for the users. Here you can click around and see how the interconnection works and what kind of information there is in each domain with a reference – and then you have a total documentation of the service provided on the data distributor where you can read more in depth.

So we have worked on some uniformity and we have come some way, but it's something we still need to work on. After all, regardless the fact that the basic data programme has been implemented, there *still exist autonomous* register administrations with their own independent needs – and also their own independent history, which *do* sets some limits.

Some standardisation has taken place and some technical barriers have been reduced - but it is still quite complex. It is still not for ordinary people yet. It is quite a big repertoire to get started with one wish to make use of basic data. So that's one of the things that we're trying to work on, with users and registers together – going forward and making it more uniform [standardised] and more accessible. But you probably never going to get beyond the fact that it is quite difficult – and that there will be special considerations to take in one register that will have a different presentation in another register.

Lea: So there is some complexity when using basic data, but that is something you have been working on and trying to reduce?

P.: Yes we have worked *quite a lot* on it *[complexity]* and we are still working on it. We have recently defined a strategic framework plan for the development of future basic data 2022 - 2027. It was approved by the steering committee for basic data, which is the highest authority in the governance that exists for basic data in operation, here on 13 October. And we then launched it on 17 November at a conference *held in* Industriens Hus *(the house of Danish Industry)*, which was attended by more than 150 decision-makers, mainly from the private sector, but also some from the public sector, but the majority came from the private sector. And yes, we had

some different focus areas on how to improve this foundation. More than 600 million DKK has been invested*;* And the reality is, as with everything else, that if it is not maintained and developed, it will weather (decay).

Lea: That leads me to the second theme. I have also been reading about the future plan for basic data and that there is a process underway to make it even more usable and, as you say, maintain it so that it creates the highest quality for those who will be using it, so that it also creates value for the end user.

That is why I would like to go further. Now, I am particularly focused on private companies and this agenda, which has also been in some of the strategies, that basic data should be a growth factor - not only in terms of making government cheaper, cutting down on workflows, but also that it should be something companies could use.

Therefore, I would like to ask - within the framework that you can provide - who is using public basic data? Can you say a bit about the target group, and through your data, who is using basic data and for what purpose?

P.: Well, we have this governance established and a user forum - I think you can also read a bit about who the members are on our website. And those who are part of that governance are by default particularly interested stakeholders. And other have particular interest may not be represented. Those who are part the governance are the register authorities, Kombit, Local Government Denmark (KL) [National association for all 98 municipalities]. Then there is the Geoforum, I don't know if you know them? It is an industry organisation. They represent both companies and users. They represent those companies that make solutions based on geodata [type of basic data]. And those companies have a basic data committee that you could contact if you are interested. And then they also particularly represent the utility sector.

Otherwise, in the user forum. parties of insurance and pension are represented and also the e-nettet. The e-nettet is part of the financial sector, so banking and mortgages. It is their joint IT company – like how the municipalities have Kombit then the financial sector has e-nettet. That is how I understand it. ATP [pension and processing company] has a seat and several others. Those are good examples of sectors represented - and yes there is a wide use of [basic data] in especially the real estate area than many other areas.

We run some of those monthly stories of basic data users on SDFE.dk. Among other things, we have had a story about Boliga, which is one of the largest housing search portals in Denmark, and they are a large consumer of basic data. And we've had a story on e-nettet as well. And what e-nettet does is that they take basic data and other sources, including the land register, and make it into an infrastructure solution that they offer to the [financial] sector – so that banks – Nordea or whatever they are called – jcan integrate it into their business.

Lea: So some of these users, they're like intermediaries, offering a service that they can use in their business model?

P.: Yes.

P.: Otherwise, we had this conference where mainly decision makers from the advisory industry were represented. Both those who are close to implementation, but also some who do business strategy in digitization. Also [IT] solution suppliers, where some of them comes from the geodata industry. And also [data] users from these sectors, who are also represented in the user forum, i.e. banking and mortgage, and insurance.

Lea: Yes, I've been reading some of these cases myself, which were quite interesting, where the authorities are also helping to promote the use of basic data - case examples. As the website also says, they should help inspire others to use basic data and the value it creates for different end users.

Therefore, I would like to hear more about what actions the authorities have taken to monitor the use? Now you yourself mentioned this application forum, and I also see that you have a LinkedIn and Twitter in terms of debate. So what are you doing from the authorities' side? Do you monitor the application or do you receive any feedback - also in terms of the application? optimisation?

P.: We have technical support which provides significant input to us both in terms of how the service is provided, how the data looks like, and how the documentation is covered. Then we have dialogues structured to a varying degrees. There are some of these big sector stakeholders that we meet with in regular intervals - both at management level but also at operational level. Some of them fairly frequently as well. And then we have this strategic framework plan where we want to take more measures and work a bit more intelligently. So that we are not dependent on those few resources we have [as an authority] but that we have the ability to make more use of the knowledge from the users – which is much greater than that of the authorities when it comes down to it. So, within one of the focus areas, which is called 'value for the users', we have a wish to look into something with partnerships and building ecosystems. Well that's a bit into the future that we need to do something about that. As I said, we have just had this strategic framework plan approved – and now we are in the process of defining the first action plans within that period and that should be approved here in the first half of 2022 – so that from the middle of 2022 we can start running a regime around the implementation of the strategic framework plan.

Lea: that's really interesting, the dialogue with stakeholders...

P.: Well, the strategic framework plan was established through extensive involvement of stakeholders. We talked to those who were in governance. It quickly became evident that there was a broad interest as well. We were also talking with the IT industry, DI digital [Danish Industry – IT]] and Dansk IT, so before the steering committee for basic data decided on this strategic framework plan, we started a process where we... (connection interrupted).

Lea: Can you continue your explanation? It was in terms of the ancestors and the strategic framework?

P.: Yes, there was just a bit with my connection. We were out having a lot of conversations with all sorts of stakeholders. And we started out without having a pre-discussed proposal or framework plan, but just a discussion paper that pointed in all kinds of directions. And also some directions that we didn't really think it should be. We wanted to have an open dialogue and that's what we got. And throughout the process we held over 40 meetings at the execution level with stakeholders and ended up with the strategic framework plan, which we are working on further in the joint public governance.

Lea: Then I really want to come back to what we were talking about before, these examples of the providers of basic data and how. You talked about different sectors, the banking sector, the utilities sector, the IT sector, where companies are using spatial data.

Can you give an idea of how basic data is used by these Danish companies and - then in terms of what you promote, how it creates value. Do you have insight into how it is being implemented by companies? How they use basic data actively? Are they using it to create new products or are they using it to optimise existing processes? Is this something you have insight into?

P.: Yes we do, let me see... (looking for link). I just thought I could find a link to a video from an event we held with Danish IT. But I can send it to you afterwards. It was a public event that we held together with e-nettet and the Geodata Board, where we talked about the use of basic data in the financial sector. And they have kind of put all their eggs in the basic data basket and made themselves dependent on the infrastructure that is built around that basic data and the way it [data] is made available. And what the CEO said, at this event, is that they cannot set up a new customer or start a loan case if it [basic data infrastructure] doesn't work. They've made themselves dependent – and they've made themselves dependent because it gives them significant value. I'd really like to find that video so you can watch it and hear it from them themselves. It involves the process in which they receive improved data and in better quality and that it [data] is made available via a technical platform – and with the technical support it has really been improved in a way they've not experienced before. They get a more professional approach to public data. And ultimately, it means they can have more efficient systems and processes and it saves them some costs. They have made huge investments and realising significant benefits.

Lea: That is, their product and service has become dependent on them having access to and using basic data via the platform. So the product and service they provide.

P.: Yes.

Lea: these are also the examples I would like to hear more about and which make it interesting...

Informal conversation about possible contacts and why the Danish case is exciting in terms of historical centralisation of public data (i.e. open government data).

P.: I can help you get some contacts to some companies. Alternatively, via the LinkedIn group on basic data, you can invite people to contact you and that you would like to talk to someone who actually uses basic data in their business. Feel free to refer to me. Then you can delve into the relationship that you may not be able to uncover in a conversation with me. They also know more about their own use than I do.

Lea: That's why it's still interesting and getting insights into use from the government side and the provider. You could say it is a relationship between provider and users which also creates the synergies to kind of reap the value - as a private actor you might have different agendas, but as I understand it, the basic data programme is also a part where you want to strengthen the public administration, but also generate value for private actors who can go in and use it for business purposes.

That is also what I have read in the strategies, that there have been these two tracks, one internal efficiency in the public sector, but also to create a data economy. You could say the public authority is sitting on a treasure trove of data that is being produced and then you can reuse it both publicly and privately.

P.: Yes.

Lea: so I would like to make use of your LinkedIn. And that's also a major agenda here with open and public data. And I find the Danish case interesting because of the centralisation which I haven't encountered before or seen in so many other countries...

P: As you're studying at Leiden University. I don't know if you've come across a study that was done by some Dutch people. It was the early in process, it was in the context of landing this political deal. The story was that when they started the basic data programme in Denmark, they took a delegation to the Netherlands to be inspired by some thought they had been boxing with for the last 10 years at that time. And then a year or so – after they [the Danish delegation] had been down there – they had a political agreement in Denmark and a grant from the Ministry of Finance to get started. I think they started out that it was going to cost 250 million DKK [3,3 million euro]. It was a substantial amount and they [The Dutch] were kind of puzzled by it – how did you manage to get that finance in one year. The results from that report can be extrapolated to the implementation phase, but also now our operational phase. Yes, the reason why we have succeeded, both at the time when a political agreement were to be realised, but also further on, implementation and now in operation. Some basic conditions for how to collaborate and have trust in each other. A lot of time was spent on preliminary analyses, so it wasn't just a top-down decision about “now we have a vision and now we agree that it's a good idea”. No, you went right down in the engine room and had technicians looking at processes in meticulous detail. So that there was a factual base for the business case which was used as a point of reference for an agreement.

Lea: Yes, I have also read a study from CBS (Copenhagen Business School), which also examines the implementation phase up to around 2015-2016. Where I can also read that the process took place across, that there was a lot of collaboration across levels. As we talked about this cross-level – that you had collaboration across the different authorities that produce data - that it has been the hallmark - this collaborative approach.

P.: There are many delegations that come to Denmark and we have also talked to several advisors who operate internationally. And we've also had contact with the World Economic Forum, the centre for the fourth industrial revolution over in San Francisco. We should not be completely blind to the fact that Denmark is somewhat unique. We have a long tradition of digital register management with central registers dating back from the sixties onwards. And we were already doing some free purchasing and distribution, where data was more easily made available. So when the basic data programme was launched, Denmark was in a completely different place from many other countries. Even a neighbour like Sweden, which is very digitalised, is in a completely different place because, unlike Denmark, they are very decentralised in their structure, which makes it a bit more difficult, and there are a lot of other problems which also make it difficult for them.

Lea: I would like to come to the fourth theme, which is also a bit more general. From the government point of view, can you put into words a little bit, we were talking about how data is going to - it's going to be societal value or economic gains - can you say a little bit about how do you see how using basic data creates value or what impact does having access to basic public data have?

P.: If you have to raise it up to a higher level. For me it's about creating a common foundation – and by using a common foundation we can create coherence for the citizen. And the citizen is - both a citizen in a municipality - and also the citizen in relation to government authorities, but also a customer somewhere. So by using a

common foundation, you can create some coherence which translate into the context of the individual end-user – where they do not necessarily have to have a separate relationship with seven different parties, but can be offered some coherent solutions with respect to the individual context of the end user can support – for instance if you are exposed to something in your life, you probably have to deal both with the municipality or the state, or perhaps private actors, e.g., payment Denmark or an insurance company – the whole process could be much easier if you, of course with the necessary respect for your interest and consent, could be offered solutions across existing public tasks.

In the long term, I also think that for the public sector there was – and this goes beyond to the political interests in the growth agenda which was the main reason the political agreement came through in the first place and why the budget became part of the financial act and that the municipalities agreed on a cut in their yearly budget – so in addition to that, there also is a significant incentive for the public sector to make public data available. Because by making public data available, data is improved – and when more data us being used, the more errors we find – and the more quality data we are able to realise will also lead to a more efficient public administration.

Lea: Again, there are these two tracks, I've read some of these case examples and the authorities are also using this data across in terms of finding solutions. I could also see at the municipal level you can use data to solve different problems. So there are both opportunities across public actors and private actors that can use data. There like the two tracks, also in the strategic agenda why it's a good idea?

P.: Yes, and then I also think, in general, that the next step for the Danish welfare society, that we look into collaboration across the private and public sector – and not necessarily look at it as two separate entities. But that we try to look at how we through some co-creation can solve some of the big societal challenges – so that we can continue to afford to have a welfare state. That presumes that we start to think in new ways and think across public and private sectors. I believe that basic data can contribute to this because it provides a common foundation.

Lea: I just have to ask here in conclusively - do you even keep data on how many people use basic data, how many are downloaded per month, what data is most used? Do you have any indicators on that?

P.: Yes we have some indicators and then we are building a system so that we can monitor it ourselves but also make it available to other registry authorities and also other users. There is an incredible amount of data being logged, so it is a question of having it made available in an intelligent way, so that you can go in and see some correlations. It is very important for us to have a tool available here. Because we don't have a - we don't have a price rate that some people are buying more or less. So we need a detailed insight into the data use, so we can both improve something and eliminate something. So, if it's not being used, we shouldn't spend resources on depicting it.

Lea: Okay, so you can create your own KPIs for what's working and what's not working?

P.: It's under development and it's going to be an essential management tool for us and also the joint public-private partners. The individual registry authority which have their own responsibility for their own exhibition, but also in terms of decisions and discussions that need to be taken in the steering group and in the user forum.

Lea: Then I just want to ask you at the very end if you have any further comments that could be relevant for the use of basic data here at the fall?

P.: Yes, I will just send you a link here where we have been measuring the value of the free geo-graphic data where some numbers have been put.

Lea: thanks for that. One last thing. Is geographic data most commonly used? Or?

P.: Yes it is used a lot. And it's not necessarily the case that because something is used a lot that the value is correspondingly high. There are about 1.3 billion calls to the data distributor currently per month and a very large proportion of those are calls to geographic services. But on the other hand, a size like the banks and mortgage sector, they use other types of data and that drives very high values for them.

Lea: so it depends again on how the end-user uses this data and how it creates value for them...

P.: Yes and value can also be more than economic value. For example the handling of the corona pandemic, where data made a significant decisive difference for Denmark, the fact that we are so digitalised. This circumstance made it possible to roll out vaccines more efficiently than in other countries and also to implement corona passports. Germany they run around and take notes on paper.

Lea: Then I just want to see if you have any questions for me in relation to the interview.

P: no nothing other than if I can have the link to the report.

Lea: Then I would like to say thank you very much for agreeing to the interview.

Interview – Product Owner, Geodata, Analysis and Communication (DinGeo.dk – Boliga.dk).

Lea: I will briefly start by telling you what themes I will be reviewing. I will go through about three themes. One theme will be why your company uses basic public data, then I will ask about how you use data, but also how it creates value in your business model or for the end user. Finally, I will ask about your assessment of the data that is being provided e.g. quality, format.

Lea: I want to know if you can briefly describe your company profile?

L: I just need to know if we are talking boliga.dk or dingeo.dk. DinGeo is a subdivision of Boliga, which is more dedicated to basic public data?

Lea: Actually both, because I know the original business was boliga.dk, but I can also see that the Boliga Group and range of services has evolved since it was launched.

L: Boliga started back in 2007, an at that time – a lot of people don't remember – at that time, a common platform, in which you could see all properties for sale in Denmark, did not exist. Back then, you had to visit each real estate website to see each property each real estate agency had for sale. And that was of course a much more cumbersome process for home-seekers having to go through multiple websites. They did not have the full overview of the housing market and maybe it was more difficult to find the smaller real estate agencies. It [the market] lacked some knowledge and some transparency. And that's where Boliga stepped in and said “we can do it in a different way”. They crawled pretty much all the home pages of various real estate agents – and then they collected them in one place. And it became very popular – because instead of having to look at 10 different websites a day, if you were looking for a home, you could just use this one website Boliga.dk.

Also, some relevant data started to become available. At first, it was the building- and housing register, which provides a lot of basic data about housing properties. It is something like, often something about making a search, then you have some criteria, where in the country it should be, how big the house should be, and then a maximum price. It's like, what can you say, the standard criteria in most cases.

That was the whole idea of it and it was later expanded with some smaller things, like some maps for some extreme rain, for example. Most recently a shadow map has been added where you can calculate from Denmark's elevation model where you have shadows on your plot. This is based on the theory that you probably want some sun on a terrace when you sit in a house or have a garden or similar. Again this is based on a dataset made available for free and then of course has been edited to fit a given situation.

Then you have the other business track dingeo.dk which actually started independently – and then later was bought by the Boliga group where the original though was.. It [dingeo.dk] actually started with the founder Peter, who is a geophysicist, who had to find a house himself. And then he sat down and looked a bit around and thought – well he didn’t want to have noise where he was going to live and he'd rather not have the risk of flooding. He knew all the places where you could find these [relevant] data. But he was a bit stuck with the fact that every time he found a property that looked interesting – he had to look in twenty different places to find out

if some other property was placed close by. And this he found to be very irritating. He's also a hobby programmer and then he thought “I might as well make a little crawler that fetches all this data when I look up an address'. And then when he had done that he thought “I might as well make it into a website now that I'm at it'. And that transpired into dingeo.dk which pulls data from about 70 different public sources – all kinds of data that you can get your hands on.

And that's how you can say: that Boliga is a portal where you can find a property that looks interesting to you – and DinGeo is a portal where you make research about the property of interest. And both of them are based to a large extent to some degree of public data. And it creates a good synergy of the whole process you as a house seeker goes through - what are the different steps you have to go through.

Lea: That's a nice extension of the next theme, which is also about how you use basic public data. The first question was really about when and why you started using public data and you've actually touched on that. So, I would like to go further to how you integrate this public data in your company or in your business model? Now I've looked at your website and I don't know if it's available for free for the end user or is there also something where you buy extra services?

L: We provide a free service to end-users where you can enter an address and then you can get some information about that address. And that's kind of what we provide to end-users. Then of course you may be in the situation where you want to look up more addresses. You might be an insurance company that wants to know about flood risk and so you might want to look up your entire customer base or potential customers or whatever it might be. And then all of a sudden it might be a hundred thousand addresses you need to investigate. So here we have a B2B business model running behind it all and so you could say that for that part our website becomes a showcase of data available.

Lea: So you could say your partial business model is so it's free but depending on if you're another company, you can buy exposure or you can buy data from you?

L: Yes.

L: Often when you want to get data into your own systems – how can you do that? – and process it. Because, if you are an analyst then you would be quite sad if you have to look up each address individually. Technically they could probably set up a crawler and I wouldn't rule out that some might do that – but we'll write us out [terms and conditions] of such situation. There are probably some who crawl us even though they're not supposed to but that's the way it is.

Lea: Well it's data and there's all sorts of technical circumstances, but otherwise as a starting point it's a service that you provide. And that means you help business and end users with how they can visualize data and use it? Is it static, where you see locations or can you also interactively go in and use multiple data sources?

L: Yes and no. We haven't really redesigned tools behind the system, but a lot of the data solutions we have, the customer will then create something they can look into. We have a lot of real estate agencies who go in and take a look and then they say 'okay we'll retrieve all the houses sold at your site then we'll make a statistics module that shows it in some aggregated form at some level.

Lea: so there some kind of aggregation model.

L: Well the interface, they're responsible for doing that themselves. It's not something we do.

Lea: Okay, that was just to understand how the business model and how data is integrated.

L: It's on the data part, the biggest part of our business is advertising from the websites.

Lea: So marketing..

L: Yes, if you take a look at our websites, you can see we have a partnership with Nordea. And they've done some analysis, funny enough, that says when you're in the market purchasing a property, you're probably in the market for a mortgage. And so they want to see that synergy effect. And since we have a lot of traffic of users, well, they want to tap into that and see if there are any of those who might want to hear what Nordea has to say about getting help with a loan.

Lea: Interesting.

L: Here we use the public data – what can you say – as a core attraction – a reason for why private users wish to make use of our website – then we need to provide something they want to look for. That is, once they have found a property, they want to know more about it – and so they google the address and then you can see there is a battle between different major players when it comes to whom is highest on the google algorithm. And then of course the rumour is which ones are the good websites to look at - because you want more than just – one thing is that it's exciting to look up an address and property on a map. But here also get a risk assessment on unpleasant side effects or all these information you otherwise wont discover if you haven't lived in a house for more than 20 years.

Lea: Yeah, the thing about being able to use multiple data sources to get some information but in one place?

L: Yeah.

Lea: So I would like to, now talked about Boliga and I also see that you have been featured as the user of the month at the Board of Data Supply and Efficiency, where it was quite interesting was this with, what you also mentioned, the thing with risk, that you can look at a dwelling and whether it is at risk of flooding, torrential rain etc. which then gives a holistic picture for the user, so it is not just where the dwelling is located, but that you can get information about other variables that may have an impact on the value of the dwelling or what you want. So I was wondering if you could elaborate a little bit more on what the benefits are of you being able to use public land data? What are the main benefits for example?

L: Well, you could say the whole business idea, at least with DinGeo, is based on open basic data. So without them, no DinGeo. That's one place to start. So that's the very foundation. And it's kind of fact, that there's an incredible amount of data, but it can be hard to find if you're just an ordinary citizen in this country – “where do I look for these datasets?”. Have you ever heard of the Danish Environmental Portal or the radar study from 2001 or something like that. You'd have to be a bit of a geek.

And then what we say – we really want to make it easily accessible. That's the service we offer, so to speak. And we know something about this information which is hard to grasp and we can convey that into an easy understandable format. And that's also why – when you look at the pages, well it's quite consistently built around [the function that] you can retrieve specific knowledge about an address – that’s it. It's not like you go

in and then you get an average flood risk of a whole municipality or something weird. It's the address that's the reference point. And most people can figure out how to enter that.

Lea: Could you try to describe a bit more about DinGeo. That was then an additional service that came later in the Boliga group tender and you said the whole foundation on that was public basic data - has that been a driver for it coming into being, can you say a bit more the process?

L: It was that story about Peter who was looking for a house and knew all the databases and thought even for a specialist like him it took way too long time. And then it's him saying “this I can do in a more comprehensible way. I can make it easier for myself. And now that I've made it easier for myself, I might as well make it easier for everyone else'. He didn't lose anything by having some algorithm on a website. And that's where he really just started to build it up. So it's really been a project of the heart.

And in the beginning, when you know Peter, he has absolutely no commercial sense whatsoever. That's not what drives him. I probably come from a different school and thought similar thoughts in a different company. And then I thought, I'll try to do some business with this. And I hooked up with Peter and started doing business on it. So it's basically a happy amateur who sat down and thought “I can do something fun with this and do something good for the world”. Because you also have to think that what the public authorities offer is to make public data available, but it's not any demand on what you do with it – that it has to be an interface or something specific. It's just that you can make data available – that’s it. And whether it's an API or some weird Excel sheet that you display or whatever – that's where one have to say “someone could take over and help”.

Lea: That's why I think your business is a quite interesting case because I'm researching public data - and now I've chosen the Danish case. And this subject about open public data has been quite prominent and you've seen a lot of policy development and implementation and the authorities had an ambition that it should generate some kind of value. But by displaying data as you say, you don't know what it can do until someone picks it up and uses it. And the way you're translating the data is really interesting and the fact that you can help end-users and other businesses with data when you're looking at housing market.

So can you say something about what kind of economic benefit you gain from by having access to these basic data and then say a little bit more about how it creates value 1) for you as a business and 2) also for the end-user? Can you elaborate on that?

L: It's hard to give an exact amount on what the specific value of basic public data is because we have different business models and it's throwing off millions a year, in round numbers. But whether I can say if it is 5.7 million DKK or 10 million DKK – that I think is difficult to estimate. But I can say that is somewhere in between. So to say exactly is the outcome of the other business or what is the result of what we do with basic data? You could say a website like DinGeo.dk, which has a turnover on the good side of 2-3 million - it's built entirely on the basic data. Now if you look at Boliga.dk which mostly has crawled data from websites from real estate agents and displayed that data – how big a business would that have been without access to the other data - that's a really good question. I can't quite say what that exact value has been added. It will be an estimate in this interval.

Lea: An estimation as indicated, that's fine - I was thinking a bit more about the processes as well. You can say by having the basic data and without the question becoming too leading. For example, on Boliga, I could read

that they had used data from private providers in the past and then in relation to when basic data became open and free of charge which then created a reduction in cost making this service available.

So they had an existing product and then this product became less expensive because you could access public basic data – and as you say with DinGeo.dk it is the very foundation for the creation of the website – and that you could also call that value creation without estimating direct figures on the innovation you made with basic data - leading to the actual development of the website?

L: yes

Lea: Then I want to focus on content/background - what exactly is available on dingeo.dk and how many data sources do you use to offer that service?

L: Right now, we make use of 70 data sources – and a large part of those are public data sources and a few of those are private sources from which we have a partnership. So we ned to manage different aspects. Different public authorities, who is providing what [data] – and sometimes a new system is implemented and then keep track of what kind of new systems has been implemented. For instance, now we have experienced this process [data distribution] for some years. In the beginning, almost everything [data] had to be opened up and made available to the public. And then at certain some point we discovered that there was something called data reliability which is quite important to provide a service that integrates data from these platforms - the public platforms. So, there was also a need to have a more valid documentation of what you are actually working with. What kind of data is it – and what is the background behind it – and what are the calculations behind – what is the background behind why the public authority says that the data is accurate and good to work with. So you could say that there has been a process where there has not been a lot of new data published but instead there has been a process of improving and providing better quality of the data that is made available.

Lea: What I would like to have elaborated is your experience with using public basic data? I can see, now I don't know exactly how you access data, but the data distributor came into production in 2020 as a single point of entry. Is that also your access point?

L: Yes for some [of the data]. It depends on the type of data. We get data in various different ways – sometimes also based on historical reasons. But for example, BBR data [information all buildings and homes in Denmark] which is one of the core data we retrieve from OIS [public authority and register] – here OIS is the distributor. It doesn't cost anything for the data, however it may costs something for the amount of data you get transferred. So we look around, where is there something that is interesting for us. Then we have a really good dialogue with the authorities, from whom we retrieve data and they also have an interest in how the data they provide gets further distributed the Danish population and that this does not just happen in a small closed circuit.

Lea: Yes, I have also talked to the Danish Agency for Data Supply and Efficiency. They have a technical support. How do you use the authorities? Do you think there is a good interaction? Can you say a little bit about how you think they run the distribution?

L: Yes, I think in general there is a lot of responsiveness and a general interest in what we do and a very positive response. I also think there is a very good response when we make contact about an issue because we can also to observe the data – and we know the data well enough to discover when there is error in the data - and that does occur because we have over 3.6 million addresses so [errors] are expected to happen. And with the

amount of users we have, then we do get some feedback that they found some errors. We simply have people manually looking through the data and saying 'there's an error' and then you have to look at it. And then we can also see why the problem is difficult to solve – and you already know beforehand when you report to them that they already know: 'indeed we already know and it is not ideal' and then we take it from there. And I think they're really good at giving good explanations. And of course there is a difference because regarding some types of data we don't really make use of the support due to the fact that it just works and that's the best support you can get.

And then we can see with some data where we choose not to connect via API that because the service is just not stable enough. And in that case we cash the data instead of downloading it and that it a bit of a work around. And some will also say that this we cannot do – because if we were to have 100 percent up-to-date data we would also need to have 3.6 addresses that were mirrored up against that API. I don't think any of the registers want us to do that. Then they would not have a service. So some small technical things like this exists. But I don't have any real criticism or anything to expose on them. I think we get a really good treatment all the way around and we can also have some good daily discussions about how to display data and how to interpret data. That is just great.

Lea: Sure, it's also interesting how the support works from the authorities and in relation to a general discussion about the usefulness of data...?

L: Yes, I think it is very much based on dialogue. Where you raise some things and then you have a conversation about it – if for instance if someone [on our part] have a wondering question towards [the authority] and there are always some who have a complaint about something until they get their way - also whether they are right or not; But then the questions from the authority is much more like: 'but how come you do it this way' and then we can tell them "why we do it this way" and then it is quite okay and we can suggest "can't you maybe do it this way instead". When there is an issue you have a very pleasant and open discussion about it.

Lea: Can you try to say a bit more, we were talking a bit about it just working and there's more quality. Can you elaborate a bit more on your experience of using basic data and assessing the actual usability? What works well and what works less well for example?

L: In general, I think that something like the data supply of maps has worked quite brilliantly – now it's actually being closed down – but that's how it is – now that it has been moved to the data distributor. That is one of the thing which just has been running smoothly and we've always been able to integrate it up against this solutions and then not really think about it anymore. So you could say there have been some processes for instance we needed data from the land registry and it just took a long time to get access to that data - it was a very complex process, but once it was in place, the system was kind of running fine behind the scenes and there's a lot of law around land registry data, so it's okay that some work had to be done. I can't think of anything where I think it's not really running that well.

We often get feedback on from our users about errors in BBR data [information all buildings and homes in Denmark]. But you have to remember that it's a register that started in the 70s, where people manually have been entering [data] over years. Yes, then there is a high risk of being an error in the data source because then it is difficult when a house original was registered to have a certain size and suddenly it has a different size and

how long can that be traced back. I really understand that it can be a cumbersome process to make these changes . And that's also what we inform our users about that there's a page where you can correct this data with your nem-id' [DigiD]. Yet, I can understand that if you as a private citizen and if you're not a super user then maybe you don't really want to sit down and deal with this data – like "am I doing a mistake and can I do this correct?". And then it ends up at the local level as a case where you must be compliant with some specific requirements. So in this regard, I can imagine that something could be quite difficult.

And then there are these cases where we discovered that the Municipality of Aarhus by accident publicly displayed some personal data because the users got really angry with us as it was us who made this mistake. And we have just, we didn't look at the files with these private information - we kind of just linked to them. You can't necessarily see that either.

Lea: It's about who owns the data, and you can say that the data that is exposed to the authorities should be filtered or not traceable - that's also a responsibility of the authorities.

Lea: Then I would like to ask about - I also read that Boliga had mentioned that their mission, among other things, was also to contribute or create a transparent housing market. So can you say something about how do your solutions contribute to, for example, greater social value? Can you put some words on it?

L: You could say there is more to it. We didn't quite get into the added value for the end-user. But that's the exactly the thing about having easy access to data that might otherwise would have been difficult to comprehend. If we turn it around: "this is what we offer – and you are able to this – and we write explanatory texts and hopefully in a language that the user can understand". And that's a place to start.

When you start to have transparency in the housing market where you use to have a huge distortion in the market, which we try to equalise, between buyer and seller – the seller who have lived at the place 20 years and therefore know everything about the property and areas, for instance, the fact that the wind comes from that direction and when it rains, then the water accumulate in this specific spot and details like that. And then you as a buyer only have the opportunity to take a look at the property when you are there – and of course you could that there are buyers who do it thoroughly – however the buyers might see the house twice for one hour at a time. And then maybe they have a housing expert with them one of the time, but otherwise they don't have more information than that. And that whole distortion in the market that is what we're trying even out a little bit, so that the information the buyer brings along and the questions the buyer are able ask are more qualified in relation to the knowledge that the seller of the house have.

And it kind of goes for both sides – that we create a level playing field so that nobody gets ripped off and nobody buys a place that wasn't really what they wanted in the first place. Because what they really wanted originally was a place isolated from noise, but that was not really the experience when they saw the property because they went on a Sunday and didn't experience the traffic of Monday morning. And in this case we can provide some information which indicate: "maybe you also should make a viewing Monday morning or in November on a rainy day". So hopefully, for the societal gain, more people don't make a miss purchase of property.

Lea: Well let me see, I think we've gone through the three themes. Yes I thought it was interesting how basic data is integrated into your business and your business model and that you have actually innovated on free public basic data.

Lea: I'm just going to ask here at the end, if there's now a follow-up on some content that I didn't just pay attention to during the interview, can I send an email with the follow-up.

L: Yes, you can do that.

Lea: So I just want to know here at the end if there's anything you think is important to add?

L: no not really.

L: Well, the one who will get a European overview, that could be interesting. Because you could say that is a the main challenge, when you sit here, and I've done this before, tried to take a review on similar business cases in other countries. Can we do some export *of our* business *model,* can we get the idea *across the borders*. And it's hard to know where to start.

Conversation about European development and what it looks like in other European countries - outside em-ne.

Lea: I'd like to say thank you very much for doing this interview. And I just need to know if you would like to review the transcript before I use it in this thesis?

Lars: I would love to.

Lea: I will. Thanks again and you'll hear from me

Translated with www.DeepL.com/Translator (free version)

3. Tables

Table 1.

Overview of digital development of open data government i.e. basic data

Strategy	Date	Vision	Main objectives	Key priorities/initiatives	Significance on public sector data i.e. basic data
The Strategy for the Digitisation of the Public Sector	2007-2010	Aim to **deliver a better, more coherent and effective public sector service through digitalization** to citizens and businesses.	**Focus on digital benefits through following strategic focus area:** 1. Improvement of public service. 2. Relocate resources from administration to citizen-cantered-service. **1. Coordinate the process of digitalization through committed collaboration across government-levels.**	**Focus area 3) Stronger collaboration to crate digital cohesion:** ***Open standards*** The main prerequisite for creating coherence between IT systems with different functions, provided by different vendors, is to ensure that the IT systems are based on the same open standards. ***Business and IT Architecture*** A coherent business and IT architecture as prerequisite for realising the full potential of the overall digitisation effort. Coherence between individual public systems is achieved by building individual projects in line with common requirements. An IT architecture also ensures that the focus is on whether the solution creates value for citizens, businesses and public authorities.	**Geodata:** Initiative to create a co-operation for geodata to **ensure the foundation of a more cohesive administration across domains and different administration levels**.
The Common Public Digital Strategy	2011-2015	Accelerate digitalisation to make the **public sector more efficiency** and exploit Denmark's position as digital front-runner. Three key challenges: *Quality* of digital service, *Security* of digital service, ***Effectiveness*****:** focus on the potential economic benefits i.e. by systematically reuse of data and digital solution across public authorities.	**Three key challenges:** 1. The end of printed forms and letters. 2. New digital welfare. **1. Closer digital public collaboration.**	**Closer digital public collaboration including four key focus areas**: **9) Robust infrastructure.** **10) Basic Data for all public authorities.** 11) Digital legislative readiness. 12) Progress and common public governance.	**Focus area 9 initiative – Common distributor of basic data** Basic data should be available in a simple, effective and stable way in order for authorities to make use of this data. Costs on distribution should be reduced. **Focus area 10 – Common basic data for all public authorities** 1) as the foundation for an efficient public sector. 2) improve quality and distribution of open data i.e. better access to basic data.
A stronger and more Digital Denmark - Digital Strategy	2016-2020	Public sector digitisation creates value and growth – and it provides efficiency	1. **Digital services must be easy-to-use, quick and ensure high quality**.	**Nine strategic focus areas**:	**Initiatives relevant to public sector data:**

		improvements as well as public trust in the digital society. Furthermore, digitisation provide better quality of public service, more cohesion and efficiency in the public sector which then create value for individuals and businesses.	The public sector must offer high quality service and welfare solutions - and the authorities will share relevant information and work together better with individuals and business. 2. **E-government must provide good conditions for growth**. Aim to reduce administration burden for business. The business community will have access to more public sector data which can lay the foundation for new business opportunities and innovation. 3. **Security and confidence** must be in focus at all times. The sense of security must be safeguarded.	1. A user-friendly and simple digital public sector. 2. **Better use of data** and quicker case processing. 3. Better and more cohesive welfare services 4. Better framework for the business community. **5. Public sector data as a growth driver.** 6. An efficient utility sector. 7. The public sector protects data. **8. Robust digital infrastructure.** 9. Digitisation for everyone.	**2.2. progress with good basic data:** Efforts set in motion to improve quality and ensure targets for basic data are met. Permanent governance structure will be established in order to secure continuous work on establishing reliable and coherent basic data of high quality. **5.1. Open public sector data**. Establishment of common public partnerships to promote public sector data including the commercial us of this type of data. This objective also include the promotion of the use of open data as well as drawing attention to the value of using data. **8.1. Good data and efficient data sharing.** Development of common public sector IT infrastructure to set the framework for sharing data between authorities. This will enable authorities in their work on standardising data and improving data. Common framework for how to create and share good data.
Strategy for Denmark's Digital Growth	2018	**Governmental vision** for Denmark to be a digital frontrunner (in response to the ongoing digital transformation). Create a framework which enables businesses to utilise opportunities inherent in digital transformation. The strategy put emphasis on the digitalisation of trade and industry which is expected to have greater societal impact i.e. generating more productivity, innovation and job creation. *__Increased focus on the use of new technologies in companies including the use of data__. The take-up of data in Danish trade and industry lower than other comparable	**Objectives** for DK's digital growth: 1. Trade and Industry must tap into the potential for growth inherent in digitalisation. 2. The best conditions for digital transformation of business. 3. Everyone should be equipped to succeed in the digital transformation.	Six main **strategic focus areas**: 1. Digital hub for strong digital growth. 2. Digital enhancement of SME's. 3. Digital skills for all. **4. Data as driver of growth in trade and industry.** 5. Agile regulation of trade and industry. 6. Strengthened cyber security in companies.	4. **Data as driver for growth** in trade and industry: **Focus on the advancement of competitiveness by utilising data** e.g. improve businesses efficiency or businesses ability to create new business models. Foundational initiative - The Basic Data Programme. Further, efforts by government to work with trade and industry to identify and make more data with commercial potential from the authorities available. **New initiatives:** The partnership for open public data – across levels of governments. Aim to promote the expansion and commercial use of open public data. Progress with good basic data – ensuring high quality in basic

		countries. As such, data offer significant benefits for companies who seize this opportunity.			data which can be used by companies, among others. The government aim to improve existing basic data via consolidating and improving quality for easier use of the data.
The eGovernment Strategy. Good Basic Data for everyone – a driver for growth and efficiency Integrated part of the digital strategy 2011-2015	2011-2015	**Realising potential of public sector data and the re-use** hereof: **Re-use of basic data to enhance task performance and efficiency** across all levels of public administration **Transforming and modernising the public sector** i.e. by effectivization of routines and tasks **Basic data** bear potential **value for private sector** to either make routines effective or use public data for new products and solutions (digital) i.e. free basic data as driver for innovation, growth and job creation. Aim to overcome main obstacle to harvest full potential of good common basic data.	**Objectives** to open and create easy-to-access high-quality basic data (public sector data). Expected tangible benefits: *The public:* Better and more smooth interaction with public authorities. *Businesses:* Less red tape and more growth through less reporting. Cheaper procurement of public data and improved foundation for new opportunities to develop data-based products and services. *Public authorities* Create effectiveness and efficiency of various administration processes.	**Five processes** to achieve the goals of the program: 1. Ensure re-use of data and prevent double registration. 2. Ensure data quality. 3. Ensure that data conform to same technical requirements to make it possible to link data. 4. Improve the distribution of common public sector data through common infrastructure*. 5. Establishment of a cross institutional basic data committee to ensure efficient and effective development. **The data distributor* A common distribution solution will accommodate the need to retrieve data rapidly, easily and reliably, and as cheaply as possible. Also, the authorities responsible for the registers will save resources, as they will no longer have to modernise a host of different distribution solutions individually.	**Basic Data definition**: Free access to basic data for everyone: - All basic data made available for free to all public authorities, private businesses and individuals - Basic data as common digital resource which may be exploited for various purposes - Resources allocated across public authorities to maintain and ensure continually availability and quality of data. Growth through open basic data: - Enhanced innovation and competitiveness in which business can test new ideas at low risk leading to great potential for innovation. - New customers, products and more jobs. - Open data to contribute to better data quality for commercial use leading to more robust business.
The Future of Basic Data	2022-2027	**The goal of basic data is to lay the foundation for future digital solutions**. The **value of the current governance and infrastructure should furthermore be activated** in which more public data is made accessible as basic data. Requires **new progress for basic data** to ensure future usage. Basic data need to deliver resent and coherent data via a stable and secure distribution platform with easy access. Basic data should be made accessible through solid public collaboration which	**The strategic framework** has been based on collaboration between SFDE and relevant stakeholders of basic data in which five focus areas will be implemented in three phases. - Consolidation - Further development - Future prospect	**Five focus areas:** 1. Focused distribution. 2. Optimised data model. 3. Basic data of high quality. 4. Committed collaboration. 5. Value for the users	*Consolidation:* - Improvement of existing basic data - Data formats - Improvement of quality of the data model - Product description of basic data governance and operation processes. - Evaluations of the collaboration with users *Further development:* - Re-tendering - Analysis of the distribution system - Compilation of data - Streamlining of data model and implementation - Improvement of data quality - Data properties - Delegation of responsibility and commitment

				ensures the establishment of ecosystems across private and public parties.		- Establishment of partnerships *Future prospects* - New technologies - More data models - Expansion of basic data - New data types - Infrastructure available - Establishment of ecosystems

Partly based on the table on 'digital transformation' (Scupola, 2018 p. 268-270).

Table 2. *Coded extract of SFDE's published use cases*

Cases on users and OGD usage	Use of OGD	Public authority	Private organisation	Key purpose of data-use	Added-value	Key factors /mechanisms
Datalogisk* (IT-firm). *Datalogic SDFE (May, 2020). "Ortofotos giver overblikket, når landmanden skal planlægge"	Use basic data i.e. orthophotos (maps)		X	Datalogisk is an IT-company which provides software to farmers who cultivates in the form of a production management programme. The programme support farmers to manage their general production i.e. keeping track of everything from sowing to harvesting. Per se, the program integrates orthophotos in combination with other geodata such as addresses, cadastral maps, and maps covering wetlands as well as the elevation model. *Datalogisk subscribes to incidents i.e. changes in data, so that the farmers always have access to the latest updated data in the system. The company supplement with paid data.	**Target group value** The data from the elevation model enables the farmers to calculate the gradients of their fields which suggests where to drain. **Availability and access** The accessibility to free and open government data makes it possible for the company to provide an improved and more competitive product. "It's a great service that the government make a large part of the data that we use available and for free. And it makes our product in Denmark far better than abroad, where there are no similar schemes" (CEO at Datalogisk). **Combining and linking data which enable visualisation** The integration of orthophotos make it possible to link data e.g. adding various data layers on top of the maps which in turn enable the farmer to gain a visual overview of their fields. **Added Value** Enhancement of product/service which create competitive advantage for the OGD user, i.e.,	**Key factors** *Availability and Access (open access)* *Combining and linking data* **Public value:** *Economic value* The integration and linking of different types of data (including basic data) into the software creates a competitive advantage through product improvement. **Value proposition i.e. commercial value** *Value for target group* Creates customer (end-user) value for farmers to enhance the operation of their production. *Data to service* Basic data which is integrated into an offline or online service function. *Data to information* The software extract and conversion of data which enable visualisation and calculation, i.e., linking and combining data to visualise and make calculations.
Boliga (website)	Use of basic data i.e. basic		X	Website that use different basic data to make	**Visualisation through various data**	**Key factors**

SDFE (August, 2020). Boligsøgende danskere er storbrugere af frie geodata	geodata and maps		property search more transparent for house seekers. Use of background maps and free geographical data which make it possible for website users to view houses in terms of location, distances to other locations, schools, nature areas or nature areas in risk of floods etc. Boliga is one of the largest user of SDFE's data and five datasets is used every day.	"In the first instance, of course, you need to be able to see where the home is located, but it's also important for our users to know how far they are from nature, school, stations and more. And you also want to see if your house is at risk of flooding in the event of a storm." **Economic value i.e. economic benefits of free open gov. data** "At first we paid a private supplier to provide maps, but the costs were high, so we switched to free data quite quickly. This means that we can have a much more transparent housing market in Denmark, because a lot of data about a property is freely available. We are light years ahead of many other countries in this respect," (CEO, Laust Farver). **Target group value** Generate transparency and enable informed decision-making Offers a service/product making use of basic data in which end-users (citizens) are able to make more informed decisions when looking for a house. This service thus creates a more transparent housing market for buyers. "That's why we use a wide range of data to give home seekers the most accurate information possible," (CEO, Laust Farver).	*Availability and Access (open access)* The ability to shift from paid data (private supplier) to free available OGD. This shift thus generates a significant cost saving as well. **Public value** *Economic value:* Using basic data which create a cost reduction on providing service. **Value proposition i.e. commercial value** *Value for target group* Creates customer value in terms of market transparency and thus more informed decision making. *Data to service* Making use of basic data to create online solution *Data to information* Enables end-users to seek relevant information from one and more data sources in a static visual format, i.e., layered maps. *Data to interface* Creates an interface for house seeker to interactively access and explore one or more data-sets
SWECO (Consulting firm) SDFE (2022). Effektive forvaltningssystemer kræver nem adgang til grunddata	Use of basic data among multiple other data sources* * i.e. other public agency data which is not part of 'basic data'.	X	Developed a management system called 'Miljøweb' which collect a lot of information, processes and data needed to execute public environmental supervision. The system is used by the public authority and municipalities to conduct supervision (joint task) with businesses, farming and water plants.	**Standardised and single access-point to data** "It has meant that there is a standardised way to access data. We might be able to get data from elsewhere, however we have one entry point to a lot of data, and it makes it easier for us to improve our product when various data is gathered in one place" (Lea Taggaard, project manager). **Open access to free government data** "If we didn't have free and unified access to basic data, it would be more expensive for us to develop MiljøWeb, as individual solutions would have to be found for each data set. But that's what you can do in Denmark, make open cross-cutting	**Key factors** *Availability and Access (open access)* One single point of access which generate an easier way to develop and improve the product/services as well as costs savings. **Public value** *Economic value:* Basic data used by private entity to develop new solution for public entities adding to profit generation. **Value proposition i.e. commercial value** *Value for target group* Enable end-users to effectively perform public task by having access to a broad range of relevant data-sets.

					solutions." (Lea Taggaard, project manager). **Target group value** Enable end-user access a broad range of set of relevant data needed to perform public tasks effectively, i.e., the supervision of businesses, farming and water plants	*Data to data* Solution which provide access to range of datasets via an interface where relevant end-users can retrieve relevant data to perform public task such as making supervision. *Data to service* Basic data which are transformed into a online or offline solution function.
E-nettet SDFE (May, 2021). En digital finanssektor har brug for gode grunddata.	Use of basic data		X	A good data foundation enables the digitalisation of various work procedures within the financial sector. E-nettet* is provides a broad range of digital solutions. Among those, E-nettet provide data which ensures a well-grounded basis to make correct property valuation. * owned by all money and real credit institutions	**Target group value** "Our customers - who are financial and mortgage institutions, real estate agents and lawyers - don't necessarily know anything about Basic Data […] We usually say that we deliver invisible solutions with visible benefits." **Data availability and access** "If we didn't have Basic Data, we wouldn't be able to aggregate data across a property and support our customers with necessary data and documentation." **Combining and linking data which enables effectively optimisation of business processes** " We link basic data together, so our customers can effectively optimize their business processes," "We are fully up and running, pulling data from the Data Distributor on a daily basis. It's running really well […]" **Consistent data flow** "What matters to us, is not if changes happen in the data infrastructure, but when they happen. We need to be able to modify our data-pull, so that we have a stable delivery." **Good governance structure** "That's why the governance structure around the Data Distributor is almost the most important thing, and we have a really good working relationship with SDFE on that."	**Key factors** *Availability and access (open access).* Access to basic data enables data aggregation and to support customer with necessary data and documentation. *Data usability and quality (data quality)* Consistent data flow which ensures stable product delivery. Provision of reliable and timely data in product delivery. *(Combining and linking data)* Ability to link and combine basic data *Government and user interaction* Proper data governance in terms of distribution as essential element. **Value proposition i.e. commercial value** *Value for target group* Creates tangible benefits in which customers are able to make correct and sound valuation of property. *Data to service* Create an infrastructure based on basic data – i.e., service function
Aarhus municipality SDFE (July, 2020). Datadrevne Aarhus.	Use of basic data i.e. basic geodata	X		To be frontrunner as data-driven municipality to solve public tasks e.g. effective urban governance	**Availability of geodata** "We are Denmark's second largest municipality, so it is also very natural that we are at the top when it comes to using data, and we pay for data	**Key factors** *Data availability and access (open access)* Availability of geodata via collaboration with data

				through the GeoDanmark collaboration, so it would be silly not to use them," (Team Leader for GIS and Geodata, Peter Schack Madsen) **Consistent flow of data** "We prioritise subscribing to data instead of maintaining local copies. That's why we have a steady stream of data, but it also ensures that we always have the most up-to-date data available. And, given our size, we probably use a few more different data sets than so many others." (Team Leader, Peter Schack Madsen) **Collaboration + effective urban governance** Public collaboration with SDFE to develop future data with the purpose to make urban governance more effective through the project TAPAS "TAPAS has huge potential for us. We have a lot of different equipment in the urban space that is not mapped. It could be rubbish bins, lampposts or litter bins. With accurate positioning, we'll have a better overview of our equipment, and eventually we might even be able to get a power cabinet repaired or a waste bin emptied by a self-driving vehicle." "Although there are many things we can do ourselves, it's a huge advantage to know that the maps are the same throughout Denmark. So we can't just look after our own little shop, and that's also why we've had a close and good working relationship with SDFE for almost many years," (Head of Digitisation at Teknik og Miljø, Søren Dall-Hansen).	authority – part of the distribution regime. *Data usability and quality (data quality)* Data subscription which ensure consistent dataflow. **Public value and mechanisms** *Effectiveness and collaboration* Ambition to ensure effective urban governance. Public value mechanism which focus on effectiveness i.e. effectiveness of urban governance and collaboration.
Odense Municipality SDFE (September, 2020). Odense gør sig klar til klimaet.	Use of basic data i.e. basic geodata	X	Development and launch of app which should make it easier for civil servants and citizens to address/deal with future climate change in which rising water levels may be a challenge. Data in the app is based, among others, on geodata provided by SDFE. Using AR-technology, the user can film an area on	**Environmental, political and social benefits** The municipality has launched a new climate adaption app, which gives an indication of where rainwater will collect in the event of extreme rainfall. This will enable both municipal staff and citizens to think of solutions to manage or divert rainwater.	**Key factors** *Data usability and quality* App based on valid data *Technical connectivity* Creating user friendly app which can enable citizens to make assessments based on basic data as integrated in the service

			their phone and then choose different data such as amount of rainfall.	"The app allows the user to prepare for the future - without having to experience it first-hand." "We often have citizens approaching us for information on potential climate impacts, and now we have a tool where they can see different scenarios based on valid data. We have tested it on a number of citizens, and we have had very good response **Visualisation via interactive app** The app enables users to visualise future challenges and potential solution. “Instead, users can get a very clear visualization of both challenges and potential solutions," (Boie Skov Frederiksen, head of department of business and sustainability)	**Public value and mechanisms** *Strategic value and Quality of life* Interactive app, using OGD, targeted at both civil servants and citizens to address and deal with future climate challenge and suggest solutions. This creates strategic value in which the app create opportunities for citizen to adapt climate change and therefor have an impact on local community. This also provide quality of life value creating in which citizens can divert and prevent climate change damage. *Mechanism of Participation* Value generation through participation in which both civil servants and citizens can contribute to future climate adaption solutions.
Jammerbugt Municipality SDFE (October, 2021). I Jammerbugt Kommune spår de om oversvømmelser.	Use of free open public data from HIPdata.dk which is not basic data *free open government data – hydrological data. Web portal governed by SFDE	X	Open public data used in a signature project in which artificial intelligence may create a model to predict floods in the future. Due to the location between The Limfjord and the North Sea, The Municipality battles issues not only stemming from the fjord and the sea but also elevated ground water. This make it difficult to predict floods. * A joint municipality project - if the results proves to be positive, the model will be extended nationally.	**Environmental, political and social benefit** Use of artificial intelligence and historical data i.e. HIP data to generate an algorithm to predict flood 3 days in advance. By looking at the linkage between different historical data, the hope is to train the algorithm to predict floods in the future. **Strategic value** This has been tested in which the model make hits on known areas of issues. However further improvement and precision is needed. Next phase: how the algorithm may generate value for citizens and businesses in the municipality.	**Key factors** *Open Access and data quality* Project mainly possible due to the open access to various and proper datasets. As such the HIP data has been essential. **Public values and mechanisms** *Quality of life value – climate adaption* Ambition to solve public issue by providing model based on open public data to predict future floods in the municipality. *Strategic value* Next phase to develop and improve algorithm to generate value for multiple stakeholders including citizens and businesses. As such the project create political opportunities to take preventive measures for climate change which also can create quality of life for local community. *Mechanism of effectiveness as value generator* Generation of public value via a public solution which may have positive collective impact thus the potential to increase the quality of the desired income.

Hjørring Municipality SDFE (2022). Geografiske data hjælper børn sikkert i skole.	Use of basic data	X	Public service delivery platform which inform both citizens and civil service about eligibility for subsidy given to children in terms of free bus card. The digital tool is based on basic geodata calculating the eligibility linking a wide range of data. The planner not only calculate the shortest route but also consider safety risks.	**Visualisation and calculation of eligibility generating effective administration** The planner is available on the municipal website in which parents can gain a quick overview whether their children are entitled to a free bus card. "With our route calculator, parents can see for themselves the specific data that determines whether their child should get a free bus pass. Parents can easily see the length of the route and traffic hazards, and they also have the option to alert us if, for example, a road is closed. Overall, we can provide a much better service to parents with this solution," **Informed, reliable and transparent decision-making** The tool enable a more efficient and transparent case handling, and thus, a better public service delivery for the citizens. Case-handling becomes more well-informed, reliable and transparent. Calculator enables the municipality to make more sound and safe decisions. "We have a feeling that there will be well over 90 percent fewer complaints now that we can provide a better service and easily explain our decision based on data that we can trust," "[…] the data we pour into our route calculator already knows where there are dangerous school roads […]. And we have the ability to make safe and informed decisions when we link that data."	**Key factors** *Combining and linking data* Ability to combine and link data in the planner. **Public value and mechanisms** *Transparency and efficiency value generators* Create a transparent and well-founded framework for decision-making hence ensuring more efficient and transparent public administration. Also generate more citizen satisfaction. Generating a range of public values via transparency and efficiency in public decision making and administration. *Strategic value and quality of life* Impact on citizens to calculate eligibility which gives them an informed picture of public decision making in case handling. This also create better understanding on decisions outcomes improving quality of life. Also the ability to make risk assessments which create more safe routes for children going to school and also longer routes in which they may be eligible for subsidies.
Halsnæs Municipality SDFE (2022). Visuelle geografiske data er en vigtig del af sagsbehandlingen i byggesager	Use of basic data in combination with other data sources	X	Basic data, i.e. background maps, is used in the municipal case-handling of construction permissions.	**Visualisation through combining data** "We use the annual aerial photographs from SDFE on an equal footing with the mapping tools. Aerial photos are important for us because we can see the buildings on a plot of land. Moreover, aerial photos go back several years, which means we can see when conditions on the site changed to what they are today," (Carsten Andersen, GIS Coordinator). **Effective administration** The usage of background maps is an important part	**Key factors** *Data usability and quality* *(Linking and combining data)* Ability to link various sourced which creates a foundation for decision making. *(Comparability and compatibility)* Ability to track historical sources of the data to identify changes over time . **Public value and mechanisms** *Strategic value:*

				of the decision-making framework when evaluating construction permissions. The big amount of data sources ensures a systematic case-handling because it provides a more complete picture of the case than looking at the physical site only. "The use of data cannot always replace orientation in reality, but when we use data, we can often get an overview that we cannot get when we are physically there," **Reliable, transparent and well-informed decision-making process** The use of data creates a more reliable framework for communications with citizens about a final decisions. "Data ensures a common starting point that both parties trust. We use the free data explicitly in our communication with citizens when we need to explain why a certain decision was made in the case processing," "Both the municipality and the citizen can look at the data and then take the dialogue from there. I think that the free data gives an openness in the dialogue, when we as a municipality can show on a map, why a citizen may not build a certain place, or why the citizen may not make an extension to his house." (Carsten Andersen, GIS Coordinator).	Enables the local authorities to plan and make better decisions about construction permissions which give them political advantage in terms of integrity. *Quality of life:* Secure proper and transparent decision making which have impact on citizens ability to expand property building. *Stewardship* The ability to make sound and well-informed decisions creating political integrity. *Efficiency, transparency as value generators.* Creates a more efficient case handling giving local authority more holistic picture evaluating construction permissions. By being able to create a more transparent and reliable decision making-process the local authority is also able to enhance public trust in the authorities and the legitimacy of their decisions.
Halsnæs Municipality SDFE (2022). Frie højdedata er vigtige for kommunernes klimatilpasningsindsats.	Use basic data i.e. basic geodata	X		Due to the past storm surge in 2013, the municipality wanted to put climate adaption on the agenda. The use open government* data supported the municipalities guidance on the construction of a new dike in response to climate changes. *use of a free public elevation model to guide the	The use of the elevation model (free and open geographical data) made the difference to the final outcome. Using the data provided by the elevation model, that was trustful, enabled the correct measurement on how high the dike should be in order to be resistant to a similar future storm surge. "It turned out that the dam had measured from a fixed point, which the elevation model showed was 30 cm too low. And our control measurement confirmed the height model data. So we were able to advise residents that they had a problem that they needed to address if they wanted to guard against a storm surge like the one that came with Bodil." The dike team association had already made	**Key factors** *Data availability and access (open access)* The free access to the elevation model and it's data made the difference for final outcome. *Data usability and quality (data quality)* Reliable data which ensure correct measurement. **Public value and mechanisms** *Strategic value* Impact the public authority ability to plan and measure the correct elevation of dike to ensure climate adaption *Quality of life:*

				measurement which proved to be too low. As such, the use of data from the model ensured reliable guidance from the municipality. "Using the public data that we know we can rely on, we could see how high the dike at Sølager would have to be if it were to withstand another storm like Bodil. And we could then advise the dike constructer on that."	Environment Secure climate adaption and create resistance of future flood scenarios.
Ministry of Internal affairs – CPR-register *national local election SDFE (2022). Sammenhængende data gør det lettere at afholde kommunalvalg.	Use of basic data i.e. CPR-register and addresses	X	Use of basic data in the logistics planning local elections. To facilitate the work, the SFDE has developed an application where municipalities can submit voting areas divided into geographical polygons to the register Denmark's Administrative Geographical Division. The data quality is improved, as all addresses in the polygon receive the specified electoral district via the application. The CPR office then automatically receives all data from the Danish Address Register.	**Combining and linking standardised data enables effective administration** The use of connected and linked data make it easier to organise local elections. The standardisation and digitalisation of necessary data has made it easier to make preparations compared to previous manual procedures. The digitalisation enables the authorities to link different data in order to make sure that the electoral letters are sent to the correct address in connection to the accurate electoral location. . "Before the elections, the CPR office checks that all data is in sync. It extracts where your home is located in an electoral district, so you get the right information about where to vote. Updating electoral districts in the CPR was previously done manually in the municipalities," "In the old days, the municipalities sat manually and entered voting districts for every single road. Today, you can just designate an area and draw a polygon - this is done by some professionals who know how to do this. So it's much easier for the municipalities," (Jeanne Olsen, Project manager at CPR register) **Data quality** "The data quality has increased as all addresses in the polygon get the specified electoral district via the application. The CPR office then automatically receives all data from the Danish Address Register." From 2013 until 2020, the Danish Agency for Data Supply and Efficiency and a number of other public parties implemented the Basic Data Programme, which resulted in many	**Key factors** *Data usability and quality (linking and combining data)* The use of connected and linked data make it easier to organise local elections. *Technical connectivity* The digitalisation and standardisation (digital infrastructure) as enabling factor for the authority to link data together to plan local elections. **Public value and mechanisms** *Mechanism of efficiency and effectiveness* More efficient and effective process of organising local election which generate strategic value for the public authority. *Strategic value:* Enhance the resource of the authorities to plan local election. Also in a more innovative way in which the calculation of voting districts can be done via a new model, i.e., the polygon.

				different data have been standardised so that they can be used in combination with each other.	
Five municipalities in North Zealand SDFE (2022). Topografiske kort sikrede overblik over nationalpark.	Use of basic data i.e. topographic maps	X	Common application to stablish a national park based on geographical data i.e. combination of topographical maps. To have the application approved the municipalities was required to provide a common framework. Basic data generated a common framework for the local areas to be included in the application.	The municipalities needed to find some common reference so they could produce a presentation of a coherent national park, and the maps enabled them to do so. "We needed to find some corridors so we could create a coherent national park, and the maps could give us the necessary overview," The unique features of the maps made it possible to combine it with other solutions and data. It was absolutely necessary for municipality to establish as common framework. "By combining SDFE's data with the cadastral map, we could get both an overview of nature areas and topography, and we could also see which landowners should be included in the idea if we were to combine the municipalities' nature areas." "It was absolutely necessary for us to have a common data basis to work from. Because of the data, we were able to submit a joint application and a joint list of the areas that should be included in the national park, the landowners who were interested in being included, and the places where the municipality or state was interested in being included." "If we hadn't had the data available, it would have been a much more time-consuming process and it would have been difficult for us five municipalities to find a common ground from which to work.".	**Key factors** *Data Availability and accessibility (open access)* Access to geodata which enabled to establish common framework and overview for public application for a new national park. The combination of topographical maps. **Public value and mechanisms** *Mechanism of intrinsic enhancement* The municipality were able to use basic data to enhance political project and ensure approval. *Political value.* Creating political value in which local government could create common ground to for public application and thereby higher chance of approval.
The Danish Ministry of Defence Acquisition and Logistics Organisation (DALO). SDFE (2022). Gode geodata sikrer Forsvarets manøvredygtighed.	Use of basic data i.e. basic geodata and maps	X	The distribution of basic geodata* is a necessity, like other supplies, for the defence to solve public tasks i.e. national defence. *through a partnership with SFDE	Having national and international partnerships, DALO is able to ensure correct data of high quality. DALO also contributes to the process of mapping territory which is part of SDFE's data collection. "Geodata and map products, like all other equipment, are important for the Defence to perform its tasks. In FMI, we produce topographic data over our own territory through our cooperation agreement with SDFE. Through cooperation with national	**Key factors** *Technical connectivity* The distribution of basic data (geodata) as a necessity for the Danish defence to solve public task. Th deployment of an infrastructure which facilitate data consumption. *Data quality and data usability (data quality)* Through partnerships, DALO ensures that the defence has right data of high quality.

				and international partners, we ensure that the Defence has geodata and maps of the right quality at its disposal." Special projects include a new mapping project of Greenland, where FMI is carrying out the mapping work in an international military production collaboration. This mapping is part of SDFE's overall project for a new mapping of Greenland. In this way, Defence contributes to the SDFE civil mapping project. "Through the cooperation agreement, FMI contributes financially to the production of data by SDFE, and that data also benefits civil society. Conversely, SDFE's deliverables to FMI rely on much of the basic data that SDFE produces. SDFE provides both geodata and maps to FMI in regular ongoing deliveries, but also collaborates on special projects." "It is crucial for the pilot's training that the simulator is as realistic as possible. From the simulator's basic flight characteristics and visual layout, to the highly advanced weapons simulations. Otherwise, training in the simulator cannot be transferred directly to the aircraft."	**Public value and/ mechanisms** *Collaboration* Cross-collaboration between public authorities which generate mutual benefits. Furthermore, DALO provides financial means to the production of data by SDFE. As such shared responsibility for the production and financing of data. *Efficiency and effectiveness:* Efficiency and effective resource utilisation. *Strategic value:* Creates economic advantage for the public defence to perform public task. Also create impact to other part of society who can (re)use the data produced through the strategic partnership.
The Danish Environmental Protection Agency SFDE (October, 2020) Vandmiljøet i danske vandløb har brug for præcise geografiske data.	Use of basic data i.e. basic geodata.	X	Use of basic geodata to the development and running of an IT-software which support the public task to plan, document, maintain and improve the ecological conditions in Danish water streams. The Water Reference is the everyday name for a piece of IT software that makes it possible to link all sorts of different data to the same physical point in a river. While the existing water data may not necessarily correspond to the actual physical conditions of the streams, the stream reference is an accurate representation of the actual location of the streams, because it is based on the GeoDanmark data that SDFE updates annually in cooperation with the municipalities. The software is a tool which allows the linking of different data to one physical point thus ensuring accurate delineation	**Strategic value** "The Water Framework Directive sets targets for good ecological status in our rivers, so we are making water plans to help us make rivers more vibrant and better habitats to meet the targets. There are different targets for each river, and as our data is based on maps from before the municipal reform, it is a complex task to maintain data in water plans and thus on rivers." The water stream reference enables the agency to create a reliable overview of the conditions of water streams in Denmark – thereby ensuring standardised data. Hence, it saves the agency from an enormous workload which otherwise would result in subjective decisions. **Technical connectivity** "We definitely need a tool to ease the administrative	**Key factors** *Technical connectivity* The creation of new technology which build on the common distribution of data enables data consumption by other authority through a tool which can translate data. Also create standardised data. **Public value and mechanisms** *Strategic value* Facilitate the authority's ability to support the sustainability of maintaining good conditions for Danish water streams. Also, it saves enormous workload creating a efficiency gains. Therefore, the ability to make better use of recourses to obtain targets. *Effectiveness and efficiency* Ensure efficient administration and qualified decision-making through the standardisation and consistency of data. Reduction of administrative burden.

			of locations which is updated yearly.	burden that the diversity of data create The Agency for Data Supply and Efficiency has thus developed the road reference, which is based on the same idea, so it was obvious that they also developed a stream reference that could unify stream data." "If we didn't have the Water Reference, we would have to laboriously work through all 18000 km of rivers when we want to move to a new and more modern map base. It would be a huge amount of work, which would probably end up in some subjective decisions." The Danish EPA's data comes from national nature and environment monitoring, from municipalities, and from a variety of mapping material, with different ways of recording data on the aquatic environment. This makes it difficult to produce a uniform nationwide treatment of water data. With a view to moving to a more modern and uniform map base in the future, the Danish EPA has needed a tool that could 'translate' the many data into a common reference. **The clever thing about the watercourse reference is that it contains a key or translator that can place the existing data correctly in relation to reality**, and thus the Danish EPA can create a nationwide accurate picture of the state of watercourses in Denmark:	And also increase the quality of the desired outcome through a more reliable overview. *Collaboration* Cross collaboration among authorities which generate value creation.
Ministry of Environment Nature Agency SDFE (June, 2020). Nyt baggrundskort og gode brugeranalyser er med til at give danskerne naturoplevelser	Use of basic data i.e. basic geodata in combination with open outdoor data from another public database.	X	Relaunch of website out-in-the-nature (udi-naturen.dk) in collaboration with, among others, the SDFE to guide citizens to nature experiences. The old website were overloaded with non-maintained data and lack of infrastructure to ensure data updates. Therefore, a need for a new simple website based on information according to the users need.	New website combine different open public data from different authorities ensuring consistent up-to-date data. Furthermore, the use of geodata i.e. maps has resulted in a user-friendly visualisation and navigation. The relaunch is part of cross-collaboration between stakeholders which improved the final product.	**Key factors** *Linking and combining data* *Technical connectivity* **Public value and mechanisms** *Quality of life* Providing a public online platforming which guide citizen to nature experiences. *Collaboration* Product of cross-collaboration between public authorities which generate better quality of life for citizens to make use of nature.
Denmark's Environment portal	Use of basic data i.e. basic geodata among other	X	The web-portal serves as a one-point of access to environmental and basic geodata data which	**Accessibility and data quality**	**Key factors**

*miljoeportal.dk – governed by a common public partnership; state, municipality and regions SDFE (August, 2021). Danmarks grønne omstilling afhænger af gode data.	public data sources on environment.	support the digital public administration of environment in Denmark. Several projects created in close collaboration with SDFE providing environmental data portals e.g. for climate adaption.	Geodata key to the whole depiction of data. Having access to good environmental data make the basis for water management and regulation. **Use by various stakeholders and sectors** The data, provided, is also used by different third party users e.g. construction industry, the financial sector, tax authorities and environmental authorities. Immense value for different stakeholders on areas such as construction and infrastructure. **Cross-collaboration**	*Data availability and access (open access).* Geodata as key to depict data – and also having access to good data facilitates basis for performing public task. *Technical connectivity* Enables third user to reutilise public data. **Public value and mechanisms** *Strategic value* Public service platform used by third party users - public and private. Create public and societal value by providing the opportunity for different groups and sectors to reutilise public data for various purposes (not defined). *Collaboration* Cross-collaboration between public authorities providing a common data infrastructure thus avoiding digital silos.

*Source: https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer

4. Thematic analysis and coding frame

Coding frame to capture key condition present in the case

Concepts	Categorisation	Codes	Framework elements	Literature
Data accessibility (*data properties)	Data access and availability	Formats	Formats deals with how open datasets are in terms of what type of format the data is published and whether these are machine- readable- and processable. Release of data in formats which enable and foster re-use.	Attard et al. (2015) Kaasenbrood et al. (2015) Ubaldi, (2013) Jetzek et al. (2014) Zuiderwijk et al. (2012) Zuiderwijk & Janssen, (2014)
		Open access/license	Open access is defined in terms of the degree of accessibility in terms of license. Whether there are any restrictions to access data, legal or economic. Or whether there is an open license which enable free re-use of data in a lawful way, data available without registration or without requiring user details.	
		Data findability	Concerns how easy data can be found. This include meta-data which is whether there is any description that inform about the source of data, provenance (who created the data), and what it represents, i.e., data about the data.	
Data usability (*data properties)	Data usability and quality (Interoperability)	Data quality	Data quality is defined as meta-conceptual. Here, data quality is defined in terms of consistency, accuracy, reliable, timeliness and also in terms of user friendliness. This also includes standardisation.	Zuiderwijk et al. (2012) Kaasenbrood et al., (2015). Zuiderwijk & Janssen, (2014) Attard et al. (2015) Zuiderwijk et al. (2012) Zuiderwijk & Janssen, (2014)
		Linking and combining data	Involves the ability to link data with other data, merging and meshing data.	
		Comparability and compatibility	Encompasses the way data is depicted when it comes to the type of data and standardisation. Whether there is a common policy for how to publish data and use of common standards.	

		Under-standability	The quality of meta-data is contingent with data quality and relates to standardisation. Common standards for meta-data. This includes the quality of the information given about the data to enable data interpretation.	
Government/User interaction (*data deposit)	Technical support, and user feedback	Technical support	This involves guidelines and principles and technical support available for users for opening and processing data publicised.	Zuiderwijk & Janssen, (2014) Kaasenbrood et al. (2015)
		Feedback mechanism	This encompass whether any mechanism for user participation is available. Whether the government or public entity interact with data users. Process where users can provide feedback on open data.	
Capabilities and capacity	Capabilities and knowledge	Data capabilities	The ability and capability of individuals and/or organisations to (re)use data. This includes technological literacy, i.e., the ability to understand and use technology and process data.	Janssen et al. (2012) Jetzek et al. (2014) Attard et al. (2015)
Technical connectivity	Technology and technical infrastructure(s)	IT-infrastructure and platforms	This relate to the technical ability to manage big a small datasets. In order to actually capture value, entities must deploy technology or create infrastructures to support individuals to process and consume data. That is to organise, analyse and visualise data. The role of ICT.	Jetzek et al. (2014) Janssen et al. (2012) Ubaldi (2013)
Data governance	Data governance	Governance structure(s)	Involves the need for sound policy for publishing data. Also, for data to be used, this presumes open data policies which aim to set up right condition and environment to stimulate use. The importance of governance which reflect intended effect and which ensures data quality, data management, policies and processes – also data reliability and protection.	Jetzek et al. (2014). Janssen et al. (2012)

Thematic analysis – framework guideline

Theme of analysis	Categorisations	Sub-categorisations
Stimulation of OGD (re)use (Zuiderwijk & Janssen, 2014; Janssen et al., 2012)	Key factors of OGD (re)use *(Expressed in the use-case or interview)	Access and availability Data usability and quality Technical support, interaction and user feedback Capabilities and knowledge Data Governance Technology and technical infrastructure
Stimulation of public value creation (Zuiderwijk & Janssen, 2014; Jetzek et al., 2014; Kaasenbrood et al., 2015; Harrison et. al., 2012)	Key-purpose of data use	Key use of data
	Added value of data use	Public value
	Significant mechanisms and values (present in the use cases and interview)	Value proposition/ commercialisation of OGD Public value generating mechanisms

5. Audit trail – government website content and articles

Basic Data

https://eng.sdfe.dk/data-creates-value/basic-public-data

https://digst.dk/data/grunddata/

https://datafordeler.dk/artikler/

https://digst.dk/strategier/digitaliseringsstrategien/20-aars-faelles-digitaliseringsstrategier/

https://datafordeler.dk/artikler/temaer/datafordeleren-leverer-grunddata-til-tiden/

https://datafordeler.dk/artikler/temaer/datafordeleren-leverer-grunddata-til-tiden/

Use cases in table 2.

**source* *https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer*

SDFE (May, 2020). Ortofotos giver overblikket, når landmanden skal planlægge. Last retrieved 1st of May, 2022 *https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/ortofotos-giver-overblikket-naar-landmanden-skal-planlaegge*

SDFE (June, 2020). Nyt baggrundskort og gode brugeranalyser er med til at give danskerne naturoplevelser. Last retrieved 1st of May, 2022 *https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/nyt-baggrundskort-og-gode-brugeranalyser-er-med-til-at-give-danskerne-naturoplevelser*

SDFE (July, 2020). Datadrevne Aarhus. Last retrieved 1st of May, 2022. *https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/datadrevne-aarhus*

SDFE (August, 2020). Boligsøgende danskere er storbrugere af frie geodata. Last retrieved 1st of May, 2022 https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/boligsoegende-danskere-er-stor-brugere-af-frie-geodata

SFDE (October, 2020) Vandmiljøet i danske vandløb har brug for præcise geografiske data. Last retrieved 1st of May, 2022 https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/vandmiljoeet-i-danske-vandloeb-har-brug-for-praecise-geografiske-data

SDFE (May, 2021). En digital finanssektor har brug for gode grunddata. Last retrieved 1st of May, 2022 https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/en-digital-finanssektor-har-brug-for-gode-grunddata

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SDFE (September, 2020). Odense gør sig klar til klimaet. Last retrieved 1st of May, 2022 https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/odense-goer-sig-klar-til-klimaet

SDFE (October, 2021). I Jammerbugt Kommune spår de om oversvømmelser. Last retrieved 1st of May, 2022 https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/i-jammerbugt-kommune-spaar-de-om-oversvoemmelser

SDFE (2022). Effektive forvaltningssystemer kræver nem adgang til grunddata. Last retrieved 1st of May, 2022 https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/effektive-forvaltningssystemer-kraever-nem-adgang-til-grunddata

SDFE (2022). Sammenhængende data gør det lettere at afholde kommunalvalg. Last retrieved 1st of May, 2022 https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/sammenhaengende-data-goer-det-lettere-at-afholde-kommunalvalg

SDFE (2022). Visuelle geografiske data er en vigtig del af sagsbehandlingen i byggesager. Last retrieved 1st of May, 2022 https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/visuelle-geografiske-data-er-en-vigtig-del-af-sagsbehandlingen-i-byggesager

SDFE (2022). Frie højdedata er vigtige for kommunernes klimatilpasningsindsats. Last retrieved 1st of May, 2022 https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/frie-hoejdedata-er-vigtige-for-kommunernes-klimatilpasningsindsats

SDFE (2022). Topografiske kort sikrede overblik over nationalpark Last retrieved 1st of May, 2022. https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer/topografiske-kort-sikrede-overblik-over-nationalpark

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SDFE (2022). Gode geodata sikrer Forsvarets manøvredygtighed. Last retrieved 1st of May, 2022 Link not working anymore. https://sdfe.dk/data-skaber-vaerdi/maanedens-anvender-cases-og-temaer (accessed December 2021).