

Why Governing Data is Difficult: Findings from Danish Local Government

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Abstract. Data governance has emerged as a promising approach for transforming organizations. While governing data as an organizational asset has clear benefits, no previous studies have reported on the particular challenges faced by practitioners in local government organizations. Against this backdrop, we investigate why it is difficult for local government organizations to explore and exploit their data assets with data governance. Following an engaged scholarship approach, we carried out six group interviews conducted with 34 representatives from 13 different Danish municipalities. From the analysis, we identified nine challenges relating to three overall themes that are critical to governing data in local government: (1) data value and overview, (2) data practices and collaboration and (3) data capabilities and politics. We explain how the three themes extend previous research in data governance and e-government literature. The implications for practice and directions for future research are discussed.

Keywords: data governance, public sector, municipalities, E-government, local government, engaged scholarship

1 Introduction

Open data, big data and predictive analytics have long promised to transform entire industries and society. Especially public-sector organizations, who routinely store large volumes of data, are keen to pursue new opportunities and create new services, but are frequently restrained by problems with their data [1]. Issues of quality, availability or accuracy appear as distinct barriers, but resolving these only constitute short-term solutions [2]. Harvesting value from data requires mastering the basics of information management, but this is not a job for the IT function alone [3]. Instead, the entire organization needs an overarching direction and here data governance has emerged as a promising approach.

Data governance refers to who holds the decision rights and is held accountable for an organization's decision-making regarding its data assets [4]. It sets the direction for an organization's data management practices. However, data governance literature is still scarce. Scholars in the field construct data governance as frameworks of decision-domains based on theoretical and at times empirical synthesis, but rarely address processes of implementation and adoption in practice [5]. While conceptual studies are important, they provide little actionable direction for organizations. Furthermore, no

studies report explicitly on the particular challenges of governing data in public organizations [6].

This paper examines data governance challenges faced by local government organizations at the municipal level of the public sector in Denmark. This is a particularly interesting case as Denmark is a world leading country in digitisation according to Europe's Digital Economy and Society Index [7]. Denmark introduced mandatory digital self-service with an 87% adoption rate as of 2016 [8]. This means that storage of digital data about citizens has exploded in the past years, demanding better data management practices. Also, the newest national digital strategy contains three goals that all depend on a number of underlying specific initiatives related to data. This includes better use of data to enable quicker case processing, public sector data as a driver for growth, and increased attention to protect data [9].

For Danish municipalities, who will be responsible for a large part of the implementation, the national initiatives will compel them to undertake structured ways of managing their data with data governance. Doing so, may in some cases seem irrelevant or even at conflict with their primary obligations as a public agency and thus complicate the endeavour to implement data governance. In addition, the creation of value from data requires both exploration of potential opportunities and exploitation of existing assets [10, 11], which in the implementation of strategy may come in many different forms [12]. Exploring data is about generating new insights, while exploiting data about applying these insights [13, 14]. As each have different objectives, it is crucial to recognize the distinction at the outset of any data initiative [13], including data governance. In this context, our paper addresses the research question: *Why is it difficult for local government organizations to explore and exploit their data assets with data governance?*

To elaborate, we focus on the management of large amounts of heterogenous data, from a variety of systems in local government organizations. This is based on the assumption that managing this data requires data governance. We address the research question through engaged scholarship [15]. Following the collaborative variant, we have engaged in joint formulation of problems with municipal practitioners to get an understanding of the challenges that might make it difficult to apply the data governance literature's recommendations in practice [16].

The paper is structured as follows. First, relevant literature is presented. Next, we describe the research approach and detail the data collection and analysis. Subsequently, we present our findings in the form of nine challenges that are central to the municipalities in relation to exploring and exploiting their data assets. The challenges are summarized as three overall themes that provide a succinct answer to the research question. We discuss the findings' contribution to research, implications for practice, and directions for future research. A short conclusion ends the paper.

2 Theoretical background

Information has been an issue of strategic importance for decades, but recent technological developments have enabled the storage of more information than ever. Data

may be considered the building blocks of information [17], and so managing information as a strategic resource means ensuring responsible treatment of data as organizational assets. Organizations should therefore be aware of their data to use them effectively and ensure their quality; as volume increases, the complexity of managing data will as well [6]. Here, data governance emerges as a structured approach. Scholars frequently discuss data governance in the context of ensuring data quality, presenting this as one of the primary goals of data governance [18–20]. While quality is important, it is only one element of effective data governance, which must be driven by and aligned with business goals [18, 21–23]. Data governance may then be defined as *companywide processes that specify decision-making rights and responsibilities aligned with organisational goals to encourage desirable behaviour in the treatment of data as an organisational asset* [24, 25]. In other words, data governance sets the principles and direction for an organization’s data management practices.

Only few studies within the data governance field focus on implementation and adoption of data governance in practice. Begg & Cairns investigate the dilemmas faced by organizations when pursuing data governance, in the context of small to medium enterprises (SMEs) [26]. They identify a series of relevant “quandaries”. First, organizations may not recognize the inherent value of their data, nor will they perceive it as existing separate from the IT systems, and some organizations may not even be able to access their data, because it is “trapped” with vendors. Secondly, organizations may understand the value data governance can deliver, but may ultimately decide that the effort to achieve this by far exceeds the perceived benefits [26]. These findings indicate that practitioners find it difficult to grasp the value-creating potential of data governance. In another study, Begg & Cairns also found that managerial and executive understanding and awareness of data have *major influence* on the organization’s ability to conceive a data governance strategy [27]. These studies are relevant to our research because they highlight the importance of understanding value, when implementing data governance, but it is not clear whether this applies to public organizations as well.

Another study has focused explicitly on the public sector, albeit with the perspective of establishing a master data management function [28]. These findings suggest establishing master data management is difficult due to a series of paradoxes. First, there is a need to identify data owners, but people remain committed to group specific functions, and not to organization-wide development. Second, although there is a recognized need for data governance, tasks and responsibilities are avoided. Third, there is a recognized need for an organization-wide vision of master data, yet individual views remain the order of the day [28]. These findings suggest implementing data-related programs across organizational units is challenging in a public-sector context, but it remains unclear whether this also applies to data governance.

The abovementioned findings suggest that practitioners find it difficult to discover, understand and harness the value-creating potential of data. As such, it provides a starting point for addressing the research question and understanding the challenges of governing data in municipalities. Concepts of exploration and exploitation [10, 12, 29] are used to characterize the identified challenges, because distinguishing between these is crucial in data initiatives [13].

3 Research approach

Our methodology can be described as engaged scholarship [15] with a particular focus on the formulation of problems *with (not for)* practitioners [16]. We followed the collaborative form of engaged scholarship to “*co-produce basic knowledge about a complex problem*” [15]. We collaborated with participants in a Danish network for municipal IT practitioners and researchers. The network was founded in 2009 as part of a joint IS research project with a number of municipalities, seeking to increase the degree of public digitalisation and municipalities' ability to innovate with IT. In its current form, the network consists of 13 municipalities and a dozen IS researchers, who collaborate on a set number of workshops and theme days each year. The participating members have previous experiences with engaging in academic IS scholarship, which helped the researchers gain access to the setting, create trust with informants, facilitate cultural understanding and establish rapport [30, 31]. It should be noted that our point of departure for this study is the problem “owners” in practice, namely people working with data in local government. Therefore, we are only concerned with the citizens perspective to the degree, that practitioners bring it up.

3.1 Research setting

Denmark is a consensual and technologically advanced society. In the Digital Economy and Society Index (2017) that summarises indicators on Europe's digital performance and competitiveness, Denmark holds the first place and is described as a world leader in digitisation [7]. The Danish national digital strategy for 2016-2020 [9] aims to further enhance the use of IT in the public sector in order to deliver good, efficient and coherent services to citizens and businesses. Moreover, the strategy contains three goals that incorporate better use of data to enable quicker case processing, public sector data as a driver for growth, and increased attention to protect data. While interpreting the national digital strategy entails complexities of prioritization, it is highly influential on both central and local government practice [32]. Danish municipalities are somewhat de-centralised and they commission and manage their own data repositories in addition to the central registers. The municipalities are not merely the executive wing of central government. They have a great deal of autonomy in how they organize the delivery of public services and are responsible for a large part of the Danish welfare state, with primary education, day care for children, social welfare, and care of the elderly as important examples. Danish municipalities constitute an interesting case because they already collect and manage vast amounts of data on their citizens. Historically, the governance of IT acquisition and development has been decentralized, focusing mainly on individual and departmental needs, causing a current landscape that is fragmented and consists of hundreds of different systems, across departments within a single municipality. This has resulted in vast amounts of heterogenous, and at times redundant, data across the municipalities, that is in dire need of governance. Ensuring that these data are managed responsibly (exploitation), as well as used to generate new value (exploration) has implications for Danish society as a whole.

3.2 Data collection

The empirical data was collected by the first author using semi-structured group interviews. The group interview is a qualitative data gathering technique that has the advantages of being inexpensive, data rich, flexible, stimulating to respondents, recall aiding, cumulative and elaborative, over and above individual responses [30]. The participants were members of the abovementioned network and came from several different layers of the municipalities, ranging from managers, to consultants, project managers and technical experts.

As there is a lack of existing empirical studies of data governance in the public sector, group interviews were used in this study to gain empirical data from several hierarchical levels in order to cover a “variety of voices” [33]. Municipalities differ across many characteristics, including size and digital maturity. Group interviews across (and among) practitioners in municipalities therefore allowed for nuances of practice to be brought forth, as the participants could discuss and reflect amongst themselves [30].

The data was collected through six sessions spanning a period of three months (see Table 1). Two sessions were of a general character including participants from different municipalities, and three sessions involved participants from the same municipality. One session only had one participant, and therefore functioned as a classic semi-structured interview [33].

Table 1. Activities for data collection

#	Activity	Participants	Hours
1	General group session	13 representatives from 9 municipalities	3
2	Individual session	1 representative from 1 municipality	1,5
3	Individual group session	4 representatives from 1 municipality	1,5
4	Individual group session	2 representatives from 1 municipality	1
5	Individual group session	2 representatives from 1 municipality	1
6	General group session	20 representatives from 12 municipalities	6
	Total	34 representatives from 13 municipalities	14

The first session introduced data governance as a viable practice and we received feedback from practitioners regarding the necessity for and utility of such an approach in municipal settings. Between session #1 and #6, the first author conducted four interviews, which had the purpose of unfolding specific barriers, challenges, or difficulties related to working with data. As these sessions had fewer participants from the same organization, more time was available for each of the participants to express their views and it was possible to touch upon topics of more sensitive character. The last session focused on presenting, discussing and validating findings, and encouraging further dialogue on how to work with data governance going forward.

3.3 Data analysis

The data was coded following the conventional approach to qualitative content analysis [34]. First by reading transcripts and field notes, highlighting interesting or relevant

parts and collecting them in a separate document. Upon completion, the extracted quotes were arranged as challenges and named. The material was then coded again, using the newly constructed challenges to collapse any duplicates and reduce potential internal contradictions. The process was repeated until challenges could no longer be created, collapsed or split.

In order to reduce potential bias, the last general group session functioned as a site to test the validity of the identified challenges. The last group session had the highest turn out, and thus allowed for valuable refinement of the findings from a variety of perspectives. The analysis resulted in the identification of nine challenges that were further conceptualized at a higher level of abstraction as three main themes (see Table 2).

Table 2. Findings from the analysis

Theme	Challenges	#
Data value and overview	Short-term perspective on data usage	1
	Value from data initiatives are difficult to understand	2
	Lack of overview of existing data	3
Data practices and collaboration	Autonomy within the different departments	4
	Distrust toward data in social fields	5
	Lack of cross-organizational collaboration	6
Data capabilities and politics	Varying levels of data maturity across different departments	7
	Lack of top-level support for data initiatives	8
	Lack of political focus on data usage in municipal context	9

4 Findings

In this section, we present each theme and then detail the challenges it consists of.

4.1 Data value and overview

The first three challenges presented above show that efforts to explore and exploit data are complicated by short-term perspectives on usage, lacking overview of existing data sources, and a poor understanding of data value. The three challenges can be summarized under the theme Data value and overview, which emphasizes the municipalities' struggle to understand and express the value-creating potential of data.

Short-term perspective on data usage. A recurring challenge throughout all the sessions revolved around the lack of understanding of what data can be used for, beyond the context of its immediate practice. Currently, data is primarily considered convenient for performing a specific workflow and as a by-product of working in a digital environment: *"Many of those who work with data are not used to thinking of data as an asset [...] It's usually very convenient if [they] can see a citizen in both systems because it's updated... but that's it"* (Development consultant)

Another participant describes municipalities as ‘sober’, when it comes to collecting and using data. The challenge is framed as a mindset that needs to be changed, rather than specific processes that have to be implemented: *“A municipality is sober: it looks at what we can use data for right now. We have to reverse the approach and acknowledge we have to collect data, even though we do not quite know what we need them for yet, and it's a mental change of dimensions”* (Head of IT)

What needs to happen is a change of the mindset in going from a reactionary to a proactive view on data. However, this will not happen by itself. The employees have to be introduced to the somewhat abstract idea of seeing data as an asset: *“People need to be told this story that you can see data as either something you depend on in being reactive, or where you consider it an asset [and] become a little more proactive”* (Development consultant)

Central points highlighted under this challenge indicate that municipalities find it difficult to start exploring the value-creating opportunities that data might have, because the Danish municipality employees are very focused on their primary obligation, i.e. the day-to-day operations of welfare services. Becoming more data-driven is therefore a major change to the organizational mindset.

Value from data initiatives are difficult to understand. Although the participants show enthusiasm and see potential in working more structured with data, they find it challenging to express the potential value to stakeholders in the rest of the organization. Especially framing the value of data initiatives to ensure economic resources for data related projects is difficult: *“Our BI (Business Intelligence) system has been three years on the way, and it has taken us long to convince our management to spend just minimal resources on this. It's hard to sell the idea of infrastructure and data as [infrastructure] upward in the organization”* (IT architect)

While the benefits seem clear to the project members, it is challenging to communicate the value of data initiatives to executive levels. At the same time, other participants question the value, but hear from other municipalities it is ‘the best thing’ to do: *“We find it hard to spot the value, but we know ... that someone says it's just the best thing you can do. It's also a good foundation [to invest in data governance] and our gut feeling tells us it's a good idea, but we just want this specific use case that illustrates ‘this is what we're going to create the foundation for’”* (Financial consultant)

What follows is an amalgamation of issues, where municipal practitioners attempt to secure resources to build an appropriate infrastructure for the future use of data (exploitation). Yet to succeed with this, they need a persuasive, illustrative use case (exploration) to convince the top layers of the organization of the relevance of investing in the use of data as an asset. As such, issues of exploration and exploitation are closely tied together here.

Lack of overview of existing data Related to challenges of building appropriate infrastructure, most of the municipalities are challenged by fragmented enterprise architecture and legacy systems. In many cases, the municipalities do not even have access to some of their own data, as it is stored on servers placed with the vendors, who delivered

the original system, and they demand high costs for providing access. This makes it near impossible to gain an overview of what data actually exists, where it is, who has access to it, and how it may generate value: *"One thing is the complexity of many different solutions, but it is something else to have 40 years of legacy systems that have been implemented at random. There was no consideration of infrastructure at that time [...] we are sitting on a gold mine of data and knowledge that we do not even know about"* (Head of IT)

At the forefront is a very concrete obstacle to exploit data assets, as they are downright difficult to access in legacy systems. Simultaneously, this also makes exploring potential value-generation nearly impossible, as no overview exists.

4.2 Data practice and collaboration

The next three challenges show that lack of cross-organizational collaboration and high degrees of autonomy within the departments makes it difficult to start governing data and exploit data assets, while distrust in certain professional domains further complicates data exploration efforts. The challenges can be summarized under the theme Data practices and collaboration, which emphasizes that diverse, local practices make it difficult for municipalities to design and implement shared data governance principles and practices.

Autonomy within the different departments. To ensure data treatment in line with the principles set forth by the data governance programme, some degree of standardized processes is necessary. Enforcing this in highly specialized and autonomous departments will be a central challenge according to several participants. The high level of autonomy is pointed to as a distinct feature of the public as opposed to the private sector: *"This is the way you implement decisions, and it is very different [from the private sector], and there is a lot of room for interpretation that makes things not so straightforward"* (Head of IT)

It is highly likely that the different departments will implement a local adaption of a decision, that fits their existing practice, rather than follow the standardized directions. To curb this problem, it is suggested to frame the principles as being of value to the departments, but this would vary too much between the different fields: *"Ideally, it should be of value, but there is a big difference between speaking to a technical department full of engineers, or [speaking to] nurses, pedagogues and teachers, because [then] you should really know your visiting hours and how to communicate"* (Development consultant)

As such, exploiting data assets in departments that are used to and comfortable with working structured and systematically with data will not require the same effort as it will in domains, where exploiting data is not common practice.

Distrust toward data in social fields In the same vein as trying to deal with autonomous departments, some professionals remain highly skeptical towards data govern-

ance and the role of data in their particular domain. Especially departments within social fields remain distrustful, as their profession is about making individual, subjective judgements regarding sensitive cases: *“Here ..., it is more feeling for the individual case and [they are asking the question] what is it even data is. Here, the anxiety [regarding data] is more pronounced”* (Financial consultant)

In addition, some professionals fear an increase in visibility of data regarding their cases, to other parts of the organization will expose them. They worry it may result in someone higher up making decisions regarding their domain, based on this data, without consulting them. Especially a fear that others might misinterpret data is apparent: *“People fear you interpret the data incorrectly, so just trusting that data is being treated and analysed correctly is a huge change-oriented project in itself”* (Financial consultant)

Overcoming a tradition of suspicion regarding data is perceived as a widespread challenge. Specialists do not trust that data will be exploited appropriately or adequately, and therefore remain skeptical about exploring avenues for new or better use of data.

Lack of cross-organizational collaboration One of the opportunities many municipalities are very keen to pursue, is combining data about a citizen from several systems across departments to gain a full overview of the individual. According to the participants, this will have transformative impact on a wide variety of elements, from the way they monitor the effects of specific initiatives to the way they deliver services to the public. Yet, to do so, the different departments have to establish tight collaboration with each other, but this is difficult: *“You can have a siloed organisation, and then work together across, with good processes. But we don’t have that. We try to facilitate data-sharing across with a BI-project, but those are just the terms. The departments simply don’t collaborate.”* (Financial consultant)

The wider the distance between what purpose a data governance process or principle serves and the person, who has to adhere to it, the less meaningful it might appear: *“The closer you move towards, where we meet the citizens and run everyday operations, the less meaningful [a data governance principle] can be experienced by the employees”* (Head of Digitalization)

As such, cross-organizational collaboration and deconstructing siloes become a pivotal part of the process of exploiting data assets. Yet, the collaborative work required may appear the least meaningful to the employees who are closest to the data.

4.3 Data capabilities and politics

The last three challenges suggest that (lack of) capabilities across departments and hierarchical levels makes it difficult to envision a strategic direction for the use of data across a municipality. The varying levels of maturity and a lack of understanding of the value-creating potential of data at both executive and political levels in the municipalities further complicate the process of exploring and exploiting data assets. There challenges can be grouped under this theme, which emphasizes the need to take varying

data capabilities across departments and management functions into account; in general and in particular, if the aim is to develop an organization-wide data governance programme.

Varying levels of data maturity across different departments Data governance entails implementing processes and principles that are supposed to be enterprise-wide. However, currently it is not possible to design such a wide-reaching data governance program for a municipality, because the different departments within the municipality have varying levels of data management maturity. Several municipalities point to the employment sector as very experienced in working with data: *"The field of employment is extremely data-driven and guided by managing information, which it has been for many years and I think it's easy to notice how the employees have this experience and focus on data quality and data usage"* (Head of Digitalization)

On the other hand, the elderly sector is in some municipalities not experienced at all, and does not realize how welfare technology may change the foundation of their entire domain. In one case, they are lacking a basic understanding of the role that IT can play in their profession: *"We have just reached out to the elder area, because we have to create a digitization strategy. They do not have it in their consciousness and we would like to help them. The first meeting we had, they thought we were there to discuss which PCs they should have and what phones they should buy. And that was probably the last thing we came to discuss"* (Head of IT)

As such, this challenge is also at the intersection of exploring and exploiting data assets. In order to design and implement data governance for the municipality as a whole, it is necessary to consider the maturity of the individual departments. Depending on the department and their existing data and work practices, it may be more reasonable to focus on either exploration or exploitation of data assets, but the relationship between these remain unclear, thus becoming challenging.

Lack of top-level support for data initiatives Gaining support from the executive levels of the municipalities is framed as a common challenge. According to participants, it is because they need the compelling use case that links working structured and systematically with data to value in the municipal context. They agree that right now, most data initiatives are powered by passionate individuals: *"The passionate cannot drive this alone, because at one point there will be no more passion left. There must be top management support"* (Project manager)

While this challenge relates to the difficulty of understanding and expressing the value that data initiatives (#2) might be able to generate, achieving top-level support also has other objectives and consequences. For example, it may be easier to communicate the value of data to the rest of the organization, if top-management has understood it and helped frame the goals of data governance as related to the overall goals of the organization. As such, this challenge remains at the intersection of exploration and exploitation; executives cannot comprehend the value creating potential of exploiting data assets, until they have seen successful examples of exploration.

Lack of political focus on data usage in municipal context. Some participants feel digitalization and management of data should be on the political agenda for their municipality. While this may appear to be related to achieving top-level support, getting politicians to see the opportunities for strategic use of data goes beyond improving administrative processes. If data was involved in political discussion, it could shape the future development of the public sector. To engage politicians will be a challenge, as few have capabilities for understanding the value of data: *"No politicians can comment on this meaningfully. It is not a political issue ... in the municipality and when I say that, I mean something like 'data is important because it can make us a better municipality' ... But it's not there, it's only administrative"* (IT architect)

Similar to attaining top-level support, this challenge is also related to the interplay between exploiting and exploring data assets. As suggested by the challenge regarding distrust towards data in social fields (#5), both exploration and exploitation of data assets in a municipal context can become a politically infused endeavour, in that it may disturb some fundamental values. Bringing data usage on the political agenda is thus both an issue of exploring data opportunities to raise awareness regarding its applicability, but also remain an issue of exploitation as powerful interests may influence its strategic direction.

5 Discussion

In this section, we discuss our findings in relation to the theoretical background section and our research question: Why is it difficult for local government organizations to explore and exploit their data assets with data governance? First, we discuss how each theme corroborates previous research on data governance, and how it relates to the broader context of e-government research (summarized in Table 3). Next, we discuss the findings' implications for practice and point to directions for future research.

5.1 Contribution to research

The theme *Data value and overview* extends Begg & Caira's findings from their SME study [26], where they found that the perception of the value-creating potential of data have a major effect on the pursuit of data governance initiatives. From our results, it becomes clear that a basic understanding of data value is also central to challenges with data governance in local government and not only in SMEs. E-government initiatives are often complicated by certain value traditions that are embedded in managers' cultural environments, but rarely explicit and sometimes at conflict with one another (Rose et al., 2015). The managers in Danish local government may hold different value positions that can be both congruent and converging. Thus, when it comes to assigning value to data in local government, many actors bring diverse interests that complicate opportunities for success. This is also highlighted by Guha & Chakrabarti [35] in their conceptualization of e-government networks. They argue e-government projects are prone to failure, if not understood as networks of actors who are forced to co-operate,

despite different goals, objectives, and culture. Competing value positions, goals, objectives and actors are thus well-known issues in e-government research, and contribute to understanding challenges within the first theme.

The theme *Data practices and collaboration* extend the findings on establishing master data management in the public sector [28]. Here, they identified a series of paradoxes that point to the difficulty of establishing organization-wide support and responsibility for data initiatives in the public sector. Our findings show that diverse practices across different municipal departments also complicates establishing cross-organizational structures for data governance, and not only master data management. Implementing IT-enabled changes in the public sector requires that processes are incorporated in existing routines, which call for consideration of situated practices and institutionalizing the changes [36]. The friction between existing practices and implementation of e-government initiatives is therefore not new nor unexamined. Additionally, Juell-Skielse et al. [37] examined different modes of collaboration and expectations in inter-organizational e-government initiatives. They found that modes of collaboration do not exist in and of themselves; rather they are inherently related to the benefits they are presumed to produce. Establishing cross-collaboration with data initiatives may therefore require heightened focus on the expected benefits.

Last, the theme *Data capabilities and politics* also extend Begg & Caira's other work on data governance in SMEs [27]. They found that an organization's ability to conceive strategic direction for their data governance is dependent on the top-level's capabilities for understanding data's value creating potential. Our results suggest that perspectives on data in local government remain short-term with a poor understanding of data value at the executive and political levels. In e-government literature, capability maturity implies a focus on the relationship between input areas, such as human, structural, relational, and IT capital and the resulting maturity stages [38]. Practitioners conducting maturity assessments of their local governments can help them prioritize strategies and resources [38] and similarly, consideration of data capability maturity might enable municipal actors to focus their exploration and exploitation efforts. Lastly, Rowley [39] conceptualizes a typology of e-government stakeholder roles related to stakeholder benefits. Understanding e-government stakeholders and mapping the benefits they gain in relation to data governance initiatives may help mobilize support from the appropriate roles.

While the three themes corroborate and extend existing data governance literature, they are not new issues in the e-government literature. This could imply that challenges related to exploration and exploitation of data assets in public organizations require specific attention and examining implementation of data governance in local government should be done with the broader e-government field in mind.

Table 3. Related research on Data Governance and E-government

Challenge theme	Research on data governance	Research on e-government
Data value and overview	SME quandary [26]	Value complexity [40]; Network management [35]

Data practices and collaboration	MDM paradoxes [28]	Situated practices [36]; Mode of collaboration [37]
Data capabilities and politics	SME quandary [27]	Capability maturity [38]; E-government stakeholders [39]

5.2 Implications for practice and future research

The central implication of this study on data governance is how municipal practitioners can understand their challenges with data governance in the context of the three themes. While paradoxes are addressed in other strands of the literature [41], conceiving of challenges constitutes a useful way to be aware of potential pitfalls and developing programs to specifically overcome these. When initiating data governance programs and attempting to implement more structured and systematic practices, it can be useful to consider how challenges might affect initiatives. It may also help managers to identify the most urgent areas and thus prioritize the scarce resources for data initiatives. Moreover, focusing on how challenges relate to issues of exploring and exploiting data assets can assist practitioners in communicating value or getting started with designing and implementing processes.

Our findings and the discussed previous research suggest that data governance in local government is a large-scale change effort that requires a lot more than just the designation of roles and responsibilities. It requires attention to the three themes and broader issues examined in e-government literature. We propose that future research delves into how the three themes of value, practices and capabilities relate or effect each other, in order to conceptualize a relevant theoretical framing of these. While municipal practitioners are keen to pursue data related opportunities, they struggle with issues of exploration and exploitation according to the findings of this study. Studies that explore the three themes' correlation, as well as how to take advantage of the interplay of exploration and exploitation activities are encouraged. Finally, we must emphasize that our investigation of challenges in data governance is limited to the views within local government organizations. Involving the citizens' perspectives and rights pertaining to governing often personal and sensitive data is a very important direction for future research, and a well-known problem in the e-government literature [42–44].

6 Conclusion

Our research shows that it is difficult for local government organizations to explore and exploit their data assets with data governance for three main reasons. Firstly, they struggle to understand and communicate the value that data and data governance might be able to create. Second, diverse, local practices complicate the design and implementation of a shared, standardized approach to data and third, varying data capabilities across departments and among managers and politicians makes it difficult to envision a strategic direction for the use of data across the organization as a whole. These three themes may assist practitioners, who wish to get started with data governance initiatives. Our findings corroborate and extend existing data governance literature for local

government organizations and in addition, suggest that the identified themes relate to broader e-government issues.

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