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Exploring data-sharing in the public sector: Experiences of Estonian local governments

Master Thesis

at the Chair for Information Systems and Information Management
(Westfälische Wilhelms-Universität, Münster)

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Date of Submission: 2024-06-07

Abstract

Public organisations, including local governments, are expected to leverage data to enhance service delivery today. Despite its critical importance, there is a notable gap in understanding the experiences of local governments in data-sharing and the factors influencing their capabilities to engage in such practices. This thesis addresses this gap by investigating data-sharing and utilisation practices within Estonian local governments, employing a qualitative case study approach. More specifically, this thesis set out to study how factors from the internal and external environments influence the capability of local governments to engage in data-sharing. The theoretical foundation of this research is an extended Technology-Organization-Environment (TOE) framework. Data was collected through qualitative interviews with employees from five Estonian local governments of varying sizes and a representative from a national association for local governments. Key findings include that the capability of Estonian local governments to engage in data-sharing is influenced by factors such as organisational structure and roles, trust, training programs, technological readiness, regulatory support, and partnerships with public and private sectors. These elements contribute to the data-sharing ecosystem, presenting both challenges and opportunities for improvement. This research contributes to the broader discourse on digital transformation in the public sector, providing empirical insights from the Estonian context and offering valuable implications for policymakers and practitioners aiming to enhance data-sharing in local governments.

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Abbreviations

DGT	Digital transformation
ICT	Information and communication technologies
TOE	Technology-Organisation-Environment Framework

1. Introduction

Outline of the problem

Data today plays a pivotal role in all public sector domains, ranging from its use in decision-making to its application in public service delivery and task automation (Merhi & Bregu, 2020). Data can be defined as "a collection of facts such as numbers, words, measurements, or textual description of things" (Akerkar & Sajja, 2016, p. 16). Urban data, in turn, refers specifically to data collected in cities, including information on the movements of people, traffic and waste, and the volumes of energy used (Barns, 2018). Such type of data holds immense potential that cities are only beginning to explore (The New Hanse, 2023).

One area in which urban data is being explored, is in smart cities, i.e. Information and communications technology (ICT) solutions to address urban challenges in areas such as transportation, public services, and disaster management. The primary goal of these ICT solutions is to enhance the efficiency and effectiveness of urban management. In this context, big data is pivotal, providing valuable insights that drive smart city initiatives (Liu et al., 2020; Zhang et al., 2022). For example, smart cities use big data to manage traffic flow, prevent congestion, and improve healthcare diagnostics (Liu et al., 2020; European Parliament, 2021).

Municipal governments, often responsible for implementing smart city initiatives, face the challenge of managing and utilising data effectively to realise the benefits of smart governance (Steenmans et al., 2023). A significant difficulty is that the data required for public sector organisations is often dispersed across various agencies and external entities (Van Donge et al., 2022). While some of the collected data is made publicly accessible as open data, the majority is controlled by private companies operating within urban environments, which are often hesitant to share this data (The New Hanse, 2023). This necessitates robust interagency information sharing and collaboration with external actors to solve complex urban problems (Malomo & Sena, 2017; Steenmans et al., 2023; Van Donge et al., 2022).

There is an ever-increasing need for collaboration between various actors to solve complex social issues (van Popering-Verkerk et al., 2022). This is linked to Gasco-Hernandez et al.'s (2022) conceptualisation of "tangled problems", i.e. which

differ from wicked problems primarily due to their complexity arising from a mix of actors, objectives, and necessary resources. A defining feature of tangled problems is the need for extensive coordination and information exchange. Digital government initiatives exemplify such tangled problems because they require coordinated data sharing, technology integration, and resource management (Gasco-Hernandez et al., 2022).

Inter-organizational data-sharing initiatives have been established to facilitate collaboration between governmental organisations, businesses, and citizens (Capgemini, n.d.; Malomo & Sena, 2017). Some municipal governments have participated in these initiatives, and the European Union has promoted their development through the Data Space for Smart and Sustainable Cities and Communities (Lozzi et al., 2023). However, collaboration is often challenging for public sector organisations due to differing values, structures, personnel, and preferences, coupled with the public sector's risk-averse and bureaucratic nature (Merritt & Kelley, 2018; Rudmark & Molin, 2023; Wilkins et al., 2015). Additionally, integrating and working with data from multiple sources is difficult for cities due to a lack of necessary skills (Municipality of Copenhagen, 2018; Susha et al., 2023).

Adopting new digital processes within public sector organisations requires organisational changes in administrative structures, as well as the development of new competencies and capabilities among employees (Edelmann et al., 2023; Malomo & Sena, 2017). Especially in the context of using data, which is often complex (i.e. unstructured and high in volume), municipal governments' structures and processes may impede effective use, leading to a need to change internal operations (Malomo & Sena, 2017). However, changes in organisational structures in the context of digitalization efforts have been found to be difficult for the public sector (Kusanke et al., 2023).

According to Manoharan & Ingrams (2018), the adoption of e-government innovations does not only depend on internal factors (such as development of new capabilities or financial and technological resources), but also on external factors such as legislation and decision-making structures. These different factors may differ significantly between local governments, and can therefore help explain variations in e-government development across local areas (Manoharan & Ingrams, 2018). This points to the fact

that when studying data use and data-sharing involving public sector organisations, it is necessary to consider both internal and external factors.

Problem statement

While some studies have already been conducted on data-sharing initiatives in the public sector and their determinants (e.g., Rudmark & Molin, 2023), more research is needed specifically on municipal governments. Studying the municipal level is important, as municipal governments often have lower data-related skills (Beckers et al., 2023) and face numerous challenges in managing data for smart city initiatives (such as data quality issues and integrating data from different sources and data ownership) (Löfgren & Webster, 2020). Furthermore, scholars have pointed out a research gap in studying the organisational structures, skills and capabilities required for cities to harness the full potential of data in municipal governments, especially in a smart city context (Abuljadail et al., 2023; De Prieelle et al., 2022; Gupta et al., 2020; Liu et al., 2020).

Data-sharing plays a key role for both public and private sector organisations today (Yang & Maxwell, 2011). Public organisations, and local governments specifically, are facing pressure to use data. In the literature on data use within the public sector, there remains a significant lack of understanding in several areas. First of all, it is not well understood how public organisations, especially local governments, develop the capacity to use data. Additionally, how factors from the internal and external environment influence this capacity and its development also remains unclear. Moreover, for municipalities to enhance their capacity in using data, it is necessary to identify and understand the main drivers behind such adoption to ensure adequate support for these initiatives. Therefore, by comprehensively studying the components that influence it both from the external and internal environment, policy makers and practitioners can develop more effective strategies (Yang & Maxwell, 2011).

Motivation of the topic & Formulation of objectives

This research aims to contribute to the existing body of knowledge by studying the participation of municipal governments in data-sharing and the factors influencing their participation. It will also aim to provide a more comprehensive perspective regarding data use within local governments. This study focuses not only on the technological

aspect, but also on the ability of public organisations to make effective use of a specific technology. Thus, this research will add to the current understanding of governmental data-sharing practices by studying how in addition to the technological aspect, organisational and environmental contexts shape and form a local government's readiness to use data and to participate in data sharing initiatives. Specifically, this research will aim to answer the following research question:

How do factors from the internal and external environments influence the capability of local governments to engage in data-sharing?

The research question will be addressed by conducting a single case study of Estonian local governments. As stated in the methodological section of this research, Estonia was selected for the case study due to its interesting context: while the central government boasts a highly developed digital infrastructure, its municipalities lag behind in digitalization.

Significance of the study

Drawing on research on data-sharing involving public organisations, and the factors impacting digitalisation efforts in the public sector, this research seeks to identify how municipal governments develop their capacity to first of all effectively use data within their government and secondly to potentially participate in data-sharing.

Moreover, this study aims to identify which factors from the internal and external environment impact the capacity of local governments to share data. Municipal governments often have limited capacity to engage in digitalisation initiatives and collaborations with external partners, coupled with the complexities of data use and application at municipal levels. Consequently, studying this topic can yield important insights into practices that foster data-sharing by examining the interplay of organisational and institutional factors influencing local government data practices.

Structure of the paper

To this end, the thesis is organised as follows. Following this introduction, Section 2 presents a comprehensive literature review, which serves to critically evaluate existing research on the topic and establish the theoretical framework for the study. Section 3

covers the research methodology employed, detailing the chosen approach and data collection techniques. Subsequently, Section 4 presents the research findings. Finally, Section 5 engages in a critical discussion of the results, drawing connections to the established theoretical framework and addressing the research questions. This thesis concludes by acknowledging the limitations of the study and proposing potential avenues for future research.

2. Literature review and theoretical framework

This section provides an overview of the existing body of literature on the use of data in the local government-setting. Next, this section provides a description of the theoretical framework of the paper, an extended Technology-Organization-Environment framework. Finally, this section will conclude with a summary of the review and the research gaps that the study aims to fill.

Data and Data capabilities

The role of data in the urban context has been established by numerous scholars. Notably, Barns (2018) details how cities generate data from "the millions of interactions and transactions that take place in cities on any given day" (p. 5). In addition, Bibri (2021) argues that data, and big data technologies in particular, can play an important role in making cities more sustainable by offering new ways of monitoring, planning and understanding urban areas. However, in order to harness any value out of data, public sector organisations need to develop new capabilities and management approaches (Fredriksson et al., 2017).

To refer to the organisational skills necessary to use data and to participate in data sharing activities, literature on IT capabilities can be consulted. Scholars have rather extensively studied IT capabilities, especially in the private sector, to assess the impact of such capabilities on for example organisational performance (see e.g. Chen et al., 2014; Sanders & Premus, 2011). The general consensus of such research is that IT capabilities have a direct impact on organisational performance.

Studies on IT capability have also been conducted in the public sector setting. Recently, Mikalef et al. (2022) studied local governments' AI capabilities, which they conceptualised as an organisation's capability to coordinate and develop different resources to effectively harness the value from implementing new technologies. More specifically, Mikalef et al. (2022)distinguished between three types of resources needed for successful technology deployment:

> i) **tangible resources**: refers to physical and measurable resources, including the technological infrastructure needed for data storage, and basic resources like financial assets;

ii) **human-related resources**: refers to both technical and managerial skills required for AI capabilities. technical skills are needed to manage data, and managerial skills are necessary for identifying key areas for AI application;
iii) **intangible resources**: refers to non-physical resources, such as the ability of organisations to coordinate between departments, the capability to pursue and manage organisational change.

Research on capabilities specific to data use has also been conducted. Such research usually hasn't referred to "data capabilities", but to more specific cases of capabilities that require data. For instance, a vast amount of research has focused on the specific case of big data analytics capability (see e.g. Gupta & George, 2016) or on open data capability (see e.g. Habib et al., 2021).

What all of these studies on IT capabilities underscore, is that the use of novel technologies needs to be accompanied by more than just the technology. The development of new skills and an organisational and cultural change needs to be accompanied. As Mikalef et al.'s (2022) conceptualisation of AI capabilities shows, just as important to the technological infrastructure is the development and fostering of human resources and intangible resources. This perspective on the adoption of new technologies can be linked to an organisational view of digital transformation, which will be expanded upon in the next subsection.

Organisational view of digital transformation

The literature on digital government frequently employs terms like digitization, digitalization, or digital transformation interchangeably (Mergel et al., 2019). Yet, digital transformation in public sector organisations is distinct from digitization or digitalization. It entails comprehensive changes in processes, culture, structure, and information systems (Tangi et al., 2021). Tangi et al. (2021) build on Mergel et al. (2019) to demonstrate that public organisations have predominantly undergone digitalization, which involves modifications to existing processes. In contrast, the more comprehensive digital transformation (DGT), which focuses on cultural and complete organisational change, is still ongoing (Tangi et al., 2021).

Tangi et al. (2021) argue that the full benefits of digital technologies require advanced levels of digital transformation (DGT). Similarly, Mergel et al. (2019) also discuss how digital transformation must be approached from a comprehensive organisational perspective, recognizing that IT alone cannot drive and support change, but rather IT serves as an enabler of change. Moreover, Sandoval-Almazán et al. (2017, p. 21) emphasise that technology alone is not sufficient for successful digitization projects in the public sector. Digital government projects should be considered complex, multidimensional undertakings that involve not just technology but also organisational structures, responsibilities, policies, and the broader economic, political, and social environments (Sandoval-Almazán et al., 2017, p. 25).

Necessary for the process of digital transformation is the need to undergo a fundamental change in organisational structures, culture, leadership, and responsibilities (Mergel et al., 2019; Tangi et al., 2021). Tangi et al.'s (2021) research indicates that changes in organisational culture are frequently overlooked or addressed only after technical systems have been updated. Therefore, managers can accelerate DGT by prioritising cultural change from the outset (Tangi et al., 2021).

Further extending on this perspective, Lember et al. (2018) introduced the concept of "technological capacity", by which the authors refer to "an ability to explore, develop and/or adapt new technological solutions in public service design, delivery and evaluation" (p. 217). They argue that the technological capacity of an organisation can be studied through a dynamic-static continuum: dynamic capacities evolve through fast and substantial modifications to an organisation's administrative capabilities, leading to changes in structure, task distribution, management practices, and power dynamics; where as static capacities are characterised through a continuation of existing ways of working. This concept aligns with Tangi et al.'s (2021) emphasis on the need for deep organisational changes to realise the full potential of digital transformation.

Based on their conceptualisation, Lember et al. (2018) studied Estonian public sector organisations, and concluded that they can be categorised into two groups: i) dynamic organisations with evolving and dynamic technological capacities and ii) static organisations with minimal and unchanging technological capacities. This categorization highlights the variability in the adoption of digital transformation across

different public organisations, echoing Tangi et al.'s (2021) findings about the varying degrees of impact on organisational structures and cultures.

In another study, Tangi et al. (2020) explored the state of digital transformation through a survey among Dutch public administrations. They found that while digitalisation efforts have significantly impacted organisational processes, employee duties, tasks, and information systems, the social system within these organisations seems less affected. This finding aligns with Lember et al.'s (2018) observation that static capacities are characterised by minimal changes. External drivers, such as pressure from stakeholders or legal obligations, emerged as the primary motivators for organisational transformation (Tangi et al., 2020). Contrary to expectations, internal barriers did not impede digital transformation, suggesting that exogenous factors drive a sense of urgency for change, overcoming perceived internal obstacles (Tangi et al., 2020).

Overview of data-sharing in the public sector

Data sharing is defined by Harvey and Tulloch (2006) as “moving data from one computer system to another” (p. 746). Moreover, data sharing is not done simply for the sake of sharing data, but it is seen as a means to achieve broader government goals and functions, requiring coordination between several parties (Harvey & Tulloch, 2006). According to Fan and Zhao (2017), inter-organisational data-sharing is receiving considerable scholarly attention, especially in the e-government literature. The challenges associated with data sharing in the public sector are both technical and institutional, as identified by Harvey and Tulloch (2006), Yang and Maxwell (2011), and Welch et al. (2016).

Harvey and Tulloch (2006) highlight both technical and institutional barriers to data sharing, such as coordination issues and varying degrees of formality in data-sharing activities. Sandoval-Almazán et al. (2017) note the difficulty of integrating data from different databases. Yang and Maxwell (2011) and Welch et al. (2016) emphasise the importance of technological compatibility, financial resources, and formal project management in overcoming these challenges. Next, Gil-Garcia and Sayogo (2016) found that availability of financial resources may determine the success of interorganizational information sharing within the public sector.

Yang and Maxwell (2011) identified a number of factors impacting intra-organisational information sharing. Starting with organisational structure and culture, they discussed how a high degree of centralisation and formalisation/formality might both impede information and knowledge sharing. Moreover, organisational culture, i.e. values and norms on how to do things within an organisation, shape a public sector organisaion's members' beliefs and interests regarding information sharing. They also identified several perceived costs from the perspective of individual employees that may impede their willingness to share information, such as a high effort or significant time needed for information sharing.

As for factors influencing inter-organisational information sharing, Yang and Maxwell (2011) identified several factors from three main perspectives: technology, management and policy. From the technological perspective, factors such as difficulties integrating heterogeneous ICT systems or security problems may play a role. Yet, scholars have specified that these technological challenges impact information sharing less and are easier to overcome than organisational and political factors. Indeed, Yang and Maxwell (2011) identified several challenges from the organisational perspective, including differing values and cultures between information sharing participating organisations. Moreover, trust is an important factor, as sharing information between different organisations involves a rather high degree of confidentiality.

As the review of prior research suggests, data sharing involving the public sector is characterised by a complex interplay of both technical and institutional factors and challenges. The challenges identified, such as coordination issues, technological compatibility, and financial resources, are highly relevant to understanding the barriers and facilitators of data sharing in the public sector. Therefore, building capacity in public sector organisations is crucial for effective data use and sharing. Mazzucato and Kattel (2020) define public sector capacity as the set of skills, capabilities, and resources necessary for policy functions. Enhancing these capacities is crucial for effective data use and sharing, as emphasised by Edelmann et al. (2023) and Malomo and Sena (2017), who highlight the need for organisational changes, skill development, and supportive leadership.

Technology-Organisation-Environment (TOE) framework

The selected theoretical framework of this paper, The Technology-Organization-Environment (TOE) Framework, has been first outlined in Tomatzky and Fleischer's "The processes of technological innovation" (Baker, 2012, p. 232). In the book, the authors outline the whole innovation process, starting from the development of an innovation, to ending with its adoption by end users. Within this process, the TOE framework is used to describe one phase of the process: how organisational context shapes the adoption and integration of technology. The TOE framework argues that three factors within an organisation's context impact the decision on whether or not to adopt a technology, namely, the technological context, the organisational context, and the environmental context (Baker, 2012, p. 232).

> The **technological context** encompasses all technologies that are pertinent for an organisation, including those that are currently used within the organisation and those that are accessible in the market but not yet integrated into the organisation (Baker, 2012, p. 232).

> The **organisational context** within the TOE framework refers to the characteristics and resources inherent to the organisation, encompassing aspects such as internal structures, communication channels, firm size, and resource availability. Various mechanisms within this context influence decisions regarding the adoption and implementation of an innovation. For example, the presence of employees with formal or informal connections to other departments facilitates innovation (Baker, 2012, p. 233).

> The **environmental context** within the TOE framework encompasses several factors, including the industry's structure, the presence of technology service providers, and the regulatory landscape (Baker, 2012, p. 235). Government regulations can significantly influence innovation within industries. For instance, when governments impose new regulations, innovation may become a necessity for compliance. Conversely, stringent safety and testing standards may hinder innovation in various sectors. Hence, government regulations can either incentivize or

> impede innovation depending on their nature and impact on industry practices (Baker, 2012, p. 235).

Baker (2012) reviewed existing literature using the TOE-framework, and found that previous studies utilising the framework have shown variations in the factors they have used to define the technological, organisational, and environmental contexts. While affirming the influence of these contexts on adoption, researchers have tailored factors to specific technologies or contexts under examination. This signifies that different innovations, national or cultural settings, and industries entail distinct factors influencing adoption, leading to varying factor selections across research studies (Baker, 2012, p. 236).

The TOE framework, despite its adaptability and widespread use in understanding innovation adoption, has seen limited evolution since its inception (Baker, 2012, p. 237). This lack of development is attributed to its generic nature, allowing flexibility in applying different factors or measures to various research contexts (Baker, 2012, p. 237). Additionally, the existence of alternative theories in adoption and innovation (such as DOI theory) reduces the need for refining TOE (Baker, 2012, p. 240). Some argue that a single theory may not suffice to explain the adoption of all types of innovations due to their diversity (Baker, 2012, p. 240). This lack of critical comparison among theories hinders their refinement (Baker, 2012, p. 241).

The adoption of innovations is influenced by technological, organisational, and environmental contexts within firms, indicating the enduring relevance of the TOE framework for researchers and practitioners. However, other theories exist alongside TOE, necessitating their integration or critique. Researchers face the challenge of addressing these competing ideas while refining TOE to be both concise and broadly applicable. Despite this, empirical evidence supports TOE's utility across diverse innovations and contexts, maintaining its prominence in organisational adoption studies (Baker, 2012, p. 243).

Most of the examples given in Baker’s (2012) explanation of the framework are from the private sector. Given the distinct characteristics and dynamics of the public sector,

such as differing organisational structures, decision-making processes, and regulatory environments, it is necessary to critically assess the statements made in the review.

Prior studies applying the framework

The TOE framework has been used in a variety of different contexts, including different sectors and countries. Ma et al. (2024) describe the framework as adaptable and broadly applicable. Thus, each researcher can decide on their own the factors that they will use to apply the TOE framework. The framework can be adapted to include relevant contextual factors specific to the technology or organisation under study (Mikalef et al., 2022). Furthermore, Ma et al. (2024) argue that unlike other innovation adoption models, such as TAM and UTAUT, the TOE framework delves more into objective factors, and thus offers more rigorous insights. Most studies applying the framework use quantitative research methods, and surveys most commonly (e.g. Ma et al., 2024; Wang & Lo, 2016;).

For example Ma et al.'s (2024) study applied the framework to research which factors influence Open Government Data during public health emergencies. In the technological context, the authors looked into the technical capability of public sector agencies. In the context of OGD, the integration of data from various standards is critical to OGD, and impacts the technical capability of a given organisation. To study the organisational context, the authors looked into factors such as the risk adversity of a given organisational culture, the presence of top management support, and macro OGD frameworks (Ma et al., 2014).

Wang and Lo (2016) similarly applied the framework to study the adoption of Open Government Data in Taiwanese government agencies. Their study found that the adoption of OGD in the Taiwanese public sector setting is determined by three main aspects: the perceived benefits, the organisational readiness, and external pressures. Notably, perceived benefits emerge and higher levels of external pressures positively correlate with increased OGD adoption, consistent with studies on various technology adoptions. The significant impact of organisational readiness on OGD adoption is observed, although with the lowest degree of influence among the three factors (Wang & Lo, 2016).

Rjab et al. (2023) apply the framework to examine the barriers encountered by smart cities when adopting AI technologies. The choice of TOE is justified for several reasons. Firstly, it acknowledges the multidimensional nature of technology adoption, considering various factors involved. TOE also offers flexibility, accommodating the heterogeneity of smart cities without being restricted by industrial, cultural, or firm size limitations. Moreover, TOE has been extensively used in studying ICT adoption, including AI, making it a dominant theory in the field. The framework's ability to integrate new factors provides researchers with the necessary adaptability to explore technology adoption in diverse contexts. Through a systematic literature review, Rjab et al. (2023) identified technological (e.g. privacy issues, digital divide issues, complexity of AI use and implementation, data quality and availability), organisational (lack of financial resources, limited skills, lack of IT infrastructure, employees resisting change), and environmental barriers (lack of a legal framework on AI) to AI adoption in smart cities. These barriers encompass issues such as privacy concerns, cybersecurity, lack of explainability, financial constraints, inadequate IT infrastructure, skill shortages, employee resistance, and the absence of a legal framework.

The extended framework

Therefore, based on the literature review, the TOE framework was chosen as the theoretical background of this paper, due to its broad applicability to different contexts and technologies, as well its adaptability to include other factors relevant to a specific context. Moreover, the framework allows to distinguish between factors linked to the technology itself, the organisation, as well as environmental factors, leading to a broad and comprehensive perspective on the adoption of a specific technology in an organisation.

To this end, to create the theoretical framework applied in this research, past empirical work was surveyed, resulting in the identification of additional factors that may influence the use of data and participation in data-sharing initiatives in local governments. The following subsection will provide a description of the extended TOE framework applied in this paper. All additional factors were included in the TOE framework by categorising them into one of the main categories, technological, organisational, or environmental context.

Networking

Networking was identified as a relevant factor to include in the framework of this paper. With networking, we can refer to Gullmark's (2021) definition of the "use of local and national networks to systematically search for ideas for innovations from outside of the focal organisation; cocreation of innovations with volunteer organisations, local and national public and private organisations and citizens" (p. 518).

In Harvey and Tulloch's (2006) research on local government data sharing, local governments with established GIS programmes serve as benchmarks for neighbouring local governments. Those without long standing GIS practices tend to adopt practices and policies through informal networking, where experiences are shared among each other.

Therefore, it will be studied whether and to what extent networking takes place in local governments' data use and sharing efforts. This factor can be categorised under the environmental context component of the TOE framework, as it entails things happening outside of an organisation.

Trust

Yang and Maxwell (2011) in their literature review identified trust in an inter-organisational information sharing setting as a factor to consider. The role of trust in interorganizational collaborations has also been discussed by Sandoval-Almazán et al. (2017), who explored the dynamics of interorganizational collaboration in public sector digitalisation projects. The authors noted that trust encompasses various aspects, including institutional trust, which pertains to regulatory frameworks and agreements aimed at minimising risk. Additionally, they highlight calculative trust, involving the assessment of risks and benefits. Finally, they emphasise relational trust, which concerns the continuous relationship between collaborative partners (Sandoval-Almazán et al., 2017, p. 55).

Trust in an inter-organisational setting can also be placed in the environmental context of the TOE framework, since trust in the data-sharing context pertains to interactions between organisations, influenced by for instance regulatory frameworks in place, and ongoing relationships between collaborative partners.

Knowledge management and Organisational learning

The importance of preserving knowledge and learning from prior mistakes has been studied by for example Gullmark (2021), who found that organisational learning, i.e. 'emphasis on sharing experiences and knowledge across the whole organisation through multiple digital tools and periodic meetings, and central coordination of innovation processes" (p. 517) is a significant factor to consider.

Van Popering Verkerk et al. (2022) argue that governance capacity, i.e. the ability of a public sector organisation to execute policies, is impacted by the ability to derive lessons from past experiences, and to develop shared knowledge and practices within an organisation. The aim is for learning to become institutionalised, or ingrained in the collaboration participants' organisations. Institutionalisation is considered important for advancing ongoing learning processes and ensuring the integration of lessons learned into institutional frameworks (van Popering Verkerk et al., 2022).

Learning also involves a social dimension, emphasising the sharing of individual insights to derive lessons and adaptations collectively. This social learning contributes to developing shared knowledge and practices within a network (van Popering Verkerk et al., 2022). Adobor et al. (2019) studied how public sector organisations can develop their organisation memory, by studying the impact of knowledge management. They found that knowledge management capability has a significant impact on organisational memory in the public sector.

The combined influence of managing knowledge within an organisation and learning from prior experiences, is categorised under the organisational context, as it refers to skills and competencies developed at the organisational level.

Political and managerial leadership

The role of leadership in supporting innovation within public sector agencies has been established by prior research, which has concluded that leadership plays a crucial role in driving digital transformation. For example, Gullmark (2021) found that public managers and politicians supported the development of innovation capabilities in

Norwegian local governments, by fostering an innovation-friendly environment in their organisation.

In addition, Yang & Maxwell's (2011) literature review on research on information sharing found that leadership can play a significant role in initiating and sustaining information sharing between different organisations, and in promoting the collaboration between organisations through e.g. setting a vision, and providing guidance and resources.

Tangi et al. (2021) highlighted the importance of top management and political leaders in selecting and supporting a leader who can effectively drive digital transformation. According to the authors, it is essential for top management and political leaders to carefully choose, oversee, and evaluate the individuals or teams leading the digital transformation efforts. These leaders should follow actions such as: implementing effective change management strategies, fostering a sense of urgency for change, setting and addressing both short-term and long-term goals, and encouraging employee participation to ensure comprehensive engagement in the transformation process (Tangi et al., 2021).

Slightly contrary to the strong impact of leadership found by the above-mentioned studies, Mikalef et al. (2022) found that senior-level IT managers' perceptions of AI's value have little impact on fostering AI capabilities because developing AI requires a coordinated, organisation-wide effort, not just the IT department. Successful AI implementation needs commitment and input from all departments since AI applications rely on data from various domain experts. Therefore, organisational structure and centralised decision-making are crucial for building AI capabilities in municipalities. Milakef et al's study suggests that decentralising decision-making may not be effective for AI development in this context.

In sum, most of the research on the role of political and managerial leadership suggests that leadership plays a strong role in driving digitalisation efforts, and therefore it is included in the extended TOE framework of this paper in the organisational context, since it pertains to the organisational characteristics of a local government.

Therefore, based on a review of the literature, an extended TOE framework was created for the purposes of this study, in order to research the internal and external factors influencing data-sharing in local governments. A visualisation of the framework can be found below in Figure 1.

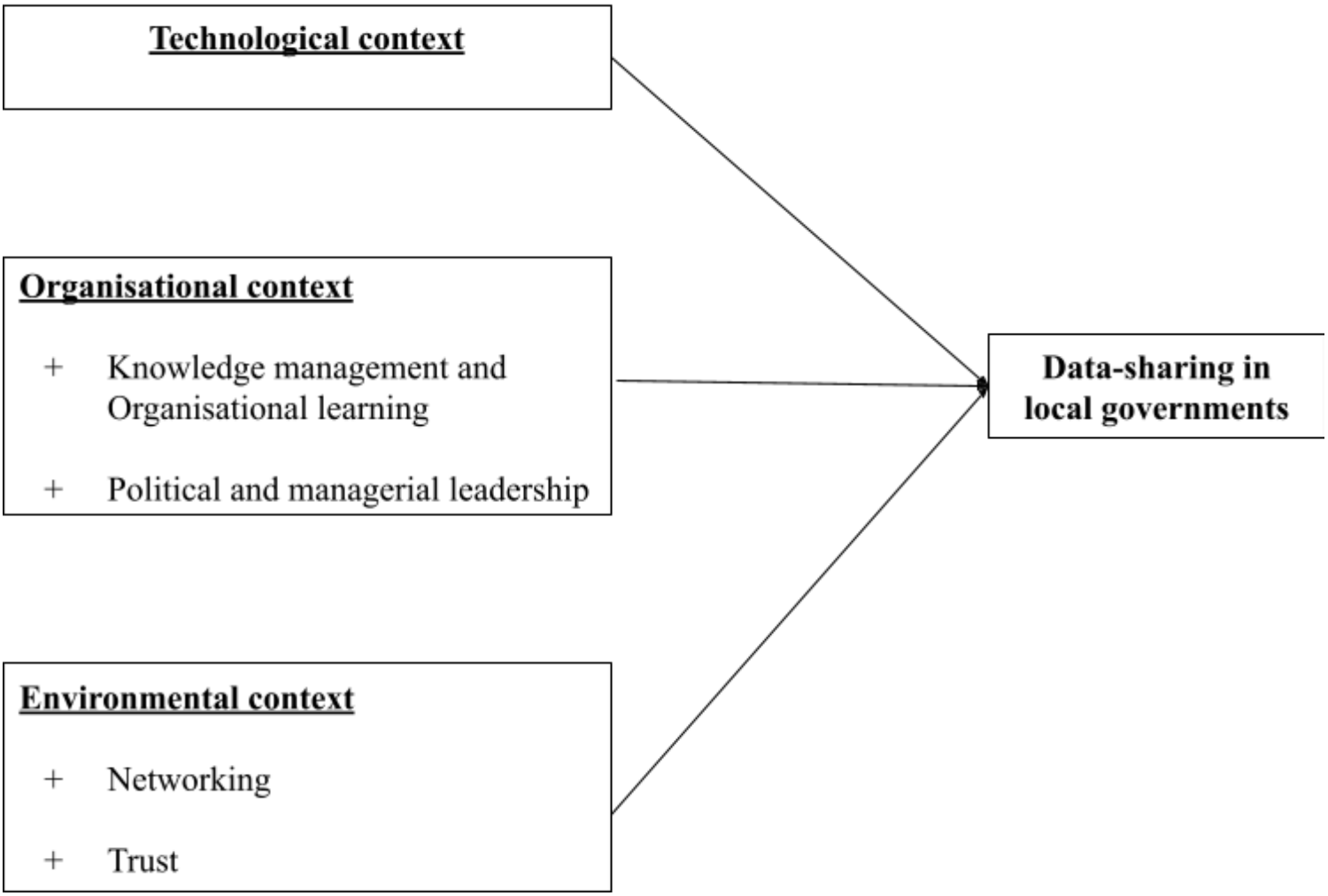

Figure 1. Extended TOE framework.

Summary

The literature review underscored the importance of a comprehensive approach to digital transformation, considering technological, organisational and environmental factors together. It underscores that the adoption of novel technologies within government frameworks can often be hindered by a myriad of organisational, technical, and environmental barriers, as evidenced by various scenarios. These impediments highlight the interplay between technology and the broader socio-political landscape, emphasising the need for comprehensive strategies that address not only technical aspects but also organisational structures, institutional frameworks, and legal frameworks to facilitate successful digital transformations in government.

However, there remains a significant gap in understanding how local governments develop the capacity to use data effectively. This research aims to fill this gap by exploring the organisational, environmental and technological factors influencing data use and sharing in municipal governments, with a focus on Estonian municipalities.

Furthermore, the literature review suggests that the majority of research on the topic of data sharing and data use in the public sector quantitative survey-based studies (e.g. Ali & Titah, 2021; Gil-Garcia & Sayogo, 2016; Harvey & Tulloch, 2006; Panagiotopoulos et al., 2023). While quantitative survey-based studies are beneficial to get a broad view of a topic and allow more easily to capture the views of a wide range of people, they don’t usually allow to get a more in-depth understanding of a phenomena. For these purposes, qualitative methods such as interviewing offer more advantages, as they allow one to focus more into specific instances and to find out how things actually are. Therefore, this study will also address the gap in acquiring in-depth qualitative information on the experiences of local government employees.

Conducting research on the technological, organisational and environmental factors impacting the ability of local governments to engage in data use and sharing enhances the depth of understanding and provides a comprehensive and evidence-based analysis.

3. Methodology

This study employs a qualitative interview approach to explore the experiences and perspectives of key stakeholders involved in data-sharing within Estonian local governments. By utilising semi-structured interviews, the research aims to capture in-depth insights into the complexities and nuances of data practices in this context. This method is particularly well-suited for understanding the subjective experiences and contextual factors that influence data-sharing and utilisation, allowing for a comprehensive examination of the factors at play. This section outlines the research design, participant selection, data collection, and analysis procedures employed in this case study of Estonian local governments.

Research Design

The overall research approach for this study is qualitative. This approach is chosen to explore the nuanced and complex nature of data-sharing and data use within Estonian local governments. Gorman and Clayton (2004) provide a comprehensive understanding of qualitative research methods within the domain of information research. They define qualitative research as a systematic inquiry process that extracts data from the context in which events unfold. The primary aim is to describe events and delve into the underlying processes in which they are embedded. Moreover, qualitative research seeks to elucidate the perspectives of individuals actively involved in the events under scrutiny. For these reasons, qualitative methods are well suited for capturing the depth and richness of participants' experiences, and the contextual factors influencing data practices in local governments.

The abovementioned conceptualisation of qualitative research by Gorman and Clayton (2004) encapsulates several fundamental features of qualitative research. Firstly, it underscores the importance of context, emphasising the collection of data within the natural setting where the phenomenon of interest occurs. Moreover, qualitative research prioritises description, often in the form of verbal narratives provided by individuals. Next, rather than focusing solely on end results, qualitative inquiry seeks to understand the entire process unfolding over time. Furthermore,by delving into the perspectives of participants, researchers gain valuable insights into the social and real-life aspects of the phenomena under investigation. Finally, qualitative research emphasises induction,

wherein possible explanations are derived based on observed phenomena rather than adhering to preconceived assumptions or hypotheses.

Gorman and Clayton (2004) explain that although various steps in the qualitative research process can be identified–starting with the identification of a research topic all the way to the reporting of findings and drawing conclusions–, in reality, the steps often overlap and most research follows them in a non-linear, iterative way.

Gorman and Clayton (2004) come up with a 'research pyramid' for qualitative research, with three stages. The researcher starts from the bottom with *preliminary preparation,* choosing the research topic, reviewing existing literature, and formulating research objectives. Moving up on the pyramid, the researcher will conduct *broad exploration*, where the sample/case study will be chosen and preliminary data collection conducted. Finally, at the third and highest stage of the pyramid, the researcher will undertake *focused activity*, where by the research activities will be further specified and narrowed down, by choosing specific themes and ideas to focus on during data collection. (Gorman & Clayton, 2004).

The specific method of this research, a case study, can be defined as "an in-depth investigation of a discrete entity (which may be a single setting, subject, collection or event) on the assumption that it is possible to derive knowledge of the wider phenomenon from intensive investigation of specific instance or case" (Gorman & Clayton, 2004, p. 47).

Case studies are an effective method for studying data sharing and use within local governments, especially when coupled with interviews, due to their ability to provide an in-depth understanding of complex processes and contextual factors. According to Yin (2018), case studies allow researchers to explore the nuances of real-life phenomena within their natural settings, which is particularly useful for examining the multifaceted nature of data sharing practices in local governments. This approach facilitates a comprehensive exploration of how technological, organisational, and environmental factors impact local governments' capacity to engage in data use and sharing.

Case studies are suitable for topics in which research is still nascent (Yin, 2018), such as municipal governments' capacity to engage in data-sharing. When selecting a case to be studied, different factors should be considered. For instance, the availability of data, i.e. ensuring that sufficient data is accessible for analysis. This includes the willingness of participants to engage in interviews, availability of documents, and other necessary information.

The richness of data available from the case is crucial for a comprehensive analysis (Creswell & Poth, 2017). Moreover, practical considerations like time, resources, and accessibility can significantly influence the choice of a case. The case should be manageable within the constraints of the research project (Baxter & Jack, 2008). Finally, it is also important to select a case that has the potential to provide insights that can contribute to theory development, practical applications, or policy implications (Flyvbjerg, 2006).

Case Description: Estonia

As was already mentioned in the introduction, this research will study Estonian local governments to limit the scope of the research. In 2023, the population of Estonia was 1 357 739 (OECD, 2023). Despite its rather small size, Estonia's national digitalisation efforts have led to its high ranking in European digitalisation indexes. In 2022, it ranked first place in the European Commission's digital public services (European Commission, n.d.*a*), second in the eGovernment index (European Commission, 2022), and ninth in the digital economy and society index (European Commission, n.d.*b*.)

Despite these advances, research on 16 Estonian cities and municipalities conducted by the Smart City Centre of Excellence of the FinEst Twins (n.d.) revealed issues faced by local authorities in their use of data. More specifically, cities and municipalities experienced a lack of necessary skills and capabilities for gathering and using data, and a difficulty in making data available to different groups of users. The second issue is interesting, as the central government has illustrated a commitment to promoting data-sharing, as exemplified by Estonia's Digital Agenda 2030, which references the importance of reusing data by sharing it across organisations (Ministry of Economic Affairs and Communications, 2021).

Furthermore, a recent study found that the overall digitalisation of Estonian local governments still has room to improve (Vihma, 2023). A reform in 2017 joined smaller local governments, thereby reducing the number of Estonian local governments (Vihma, 2023). The reform aimed to increase efficiency, but it has negatively impacted the state of digitalisation in local governments. More specifically, the reform resulted in fewer financial resources at local levels and, thus, a decrease in the capacities of municipal governments (Vihma, 2023).

The combination of Estonia's advanced digitalization at higher governmental levels, ongoing challenges at the municipal level, and the central government's commitment to data-sharing creates an interesting setting to explore how local governments navigate and enhance their governance capacity to engage in data-sharing. If it is to be expected that data-sharing in the Estonian public sector will increase in the future due to the country's current Digital Agenda, the capacity of municipal governments to effectively engage in data-sharing will provide important insights into their organisational preparedness.

Furthermore, significant differences exist in the socio-economic development of Estonian regions, for instance in terms of incomes and GDP (OECD, 2023). These regional differences are exacerbated by the fact that economic activities and profitable job opportunities are increasingly centralised in large urban regions at the expense of less urban areas (OECD, 2023). This means that local governance capacity is highly uneven between different-sized municipalities (OECD, 2023).

After the administrative reform of 2017, the number of local governments was decreased (Rahvaloendus, n.d.), and thus today, Estonia has 79 local government units, consisting of 15 towns and 64 rural municipalities. Each local authority independently manages and organises all local matters. Despite their size, all local government units—both towns and rural municipalities—share equal legal status and are required to carry out the same duties and provide the same range of services to their residents (Ministry of Finance, n.d.*a.*).

The primary responsibilities of local authorities, as outlined in the Local Government Organisation Act, include organising social services, providing social benefits and

assistance, caring for the elderly, and supporting cultural, sports, and youth activities. They also manage housing, utilities, water and sewerage, public services, amenities, waste management, spatial planning, local public transportation, and the construction and maintenance of local roads and streets, unless these tasks are legally assigned to others (Ministry of Finance, n.d.*a.*).

All local government units must draft a development plan which needs to provide direction for the future of the unit, provide strategic objectives and desired outcomes for each area of activity, etc. The central government supervises local governments to ensure that all municipal administrative procedures are carried out lawfully. This external control is carried out by ministries and agencies. For instance, The Ministry of Justice oversees the legality of local government administrative acts and procedures, while the Ministry of Finance monitors the lawful and justified use of state assets (Ministry of Finance, n.d.*a.*).

All local authorities can join regional and national associations of local authorities. For example, the national Association of Estonian Cities and Rural Municipalities aims to support local government development, represent the interests of its members, promote cooperation and collaboration between local government units, and to enhance their ability to perform their functions (Ministry of Finance, n.d.*a.*)

An additional factor that makes Estonia an interesting and unique case is the role of the central government. Namely, the central government has mandated by law, that each local government must be integrated with a centrally developed X-road data interoperability layer. This means that even if local governments themselves do not wish to share data with other governmental organisations, they have to do it by law, and the digital tools required for it are provided by the central government.The Estonian X-Road data exchange platform interlinks public sector databases, including those of municipal governments (Soe et al., 2022). The platform has been widely seen as a success, yet it has been observed that cities still face issues in accessing data owned by different city departments (Soe et al., 2022).

Methodological steps

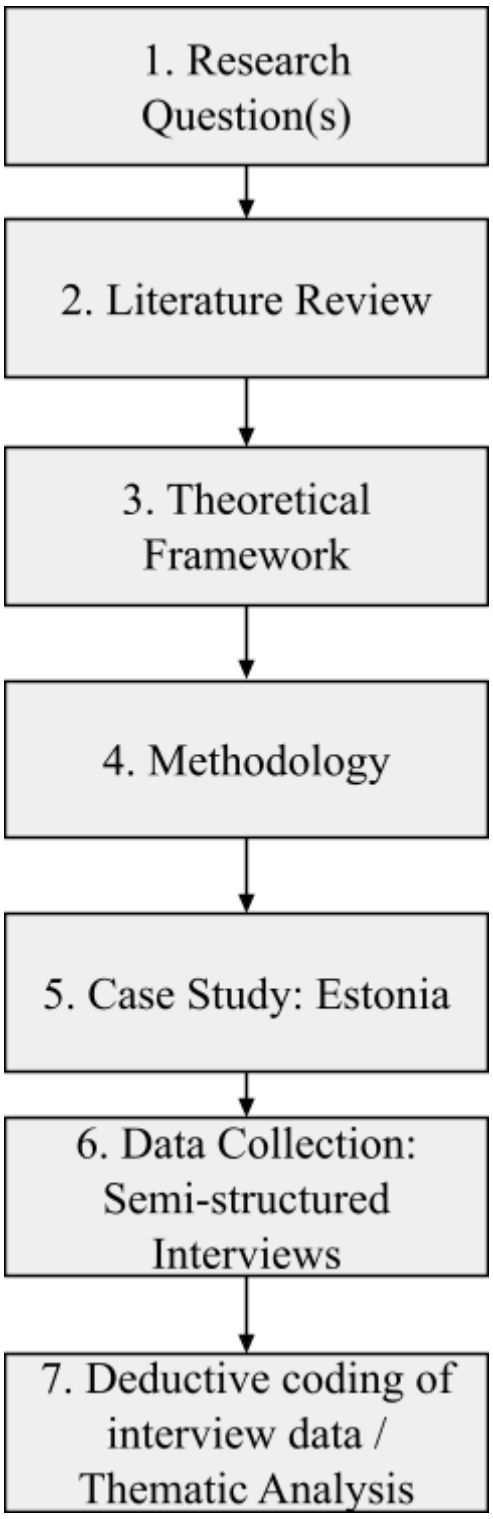

Figure 2. Steps of the research process

The research started with the formulation of research objectives and questions. Next, a review of literature was conducted to review existing research on the topic, and to identify factors that could influence the capacity of local governments to use data and participate in data-sharing. Next, the findings of the literature review were used to create the theoretical framework. As a next step, literature was collected to get more information on the Estonian administrative landscape, and especially on the state of the digital transformation and the use of data at the local government level. Sources of literature here included grey literature (e.g. governmental documentation, annual reports, previous studies on the Estonian context).

Next, **s**emi-structured interviews were conducted with representatives from Estonian local governments and with one representative from a national-level association for local governments. The data collection was followed by a thematic analysis of interview data to identify relevant sections of interview responses that match with the categories of the TOE framework.

Data collection

The data collection process for this study involved conducting interviews. More specifically, semi-structured interviews were conducted, by working with a predefined questionnaire, but also allowing for flexibility during the interview in the form of probing and asking additional questions based on the participants' answers. Semi-structured interviews allow flexibility for each interview to unfold differently based on the participants answers', while also providing uniformity, as the same base questionnaire is used for each interview and thus each interview will cover the same themes (Edwards & Holland, 2013, p. 29). Moreover, open-ended questions were used to allow for 'unexpected insights' to arise that wouldn't have emerged with closed questions (Gorman & Clayton, 2004, p. 125).

When starting to compose the sample for this research, the question on how many interviews needed to be conducted was reflected on. In qualitative research, the question of what is an adequate sample size in qualitative research has long been discussed with no consensus reached across scientific fields. According to Gill (2020), an adequate sample size should not be determined through following rigid rules, but instead researchers must collect enough data until they have enough results to answer their

research question(s). However, it is generally acknowledged that sample sizes in qualitative research are much smaller than in quantitative research, since generalisability, which is an important goal for quantitative studies, is not a goal of qualitative designs (Gill, 2020).

To simplify things, theoretical saturation is often applied in qualitative research as a guide to indicate when to stop sampling. The concept of theoretical saturation implies that data collection should end only when no new insights are collected, i.e. when interviewees only repeat what has already been mentioned by previously interviewed participants (Edwards & Holland, 2013, p. 65). At this point, no new data is needed since additional data is not considered to add anything to the research (Fugard & Potts, 2019, p. 6).

Therefore, the aim in this research was to conduct interviews until theoretical saturation was reached. However, in practice, practical issues may often impede theoretical saturation from being reached, as due to time constraints, only a limited number of interviews can be conducted. Indeed, as Edwards and Holland (2013, p. 40) note, most research is 'driven by' practical and pragmatic reasons, rather than philosophical assumptions. Nonetheless, Hennink and Kaiser (2022) posit that saturation in qualitative research is generally reached with 9-17 interviews.

It is common and acceptable to use more than one sampling method in qualitative research (Gill, 2020). Accordingly, in this research both purposive and snowball sampling were employed. Purposive sampling was applied in the first instance. Participants who were believed to be information rich and knowledgeable about the research topic were contacted (Gill, 2020). More specifically, in order to create a preliminary interviewee selection pool, the research supervisor, who has previously conducted research into Estonian local governments in the smart city context, provided contacts who could match the participant criteria of having experience in data use and data-sharing.

Purposive sampling provides benefits such as cost-efficiency and being able to select participants most beneficial to the study (Gill, 2020). Therefore, through this sampling method, participants from the list provided by the supervisor were contacted. These

participants came from 16 different municipalities, which were of different sizes and from different parts of Estonia.

Out of the initial pool of contacts, only a few were willing to participate in this research, and therefore, as a second sampling method, additional interviewees were recruited via snowball sampling. This is a method wherein initial interviewees were asked to suggest individuals who could provide valuable insights on the research topic and were subsequently approached for interviews (Gill, 2020). Snowball sampling offers several advantages, including practicality, cost-efficiency, and the ability to identify relevant participants (Gill, 2020). However, it is important to note a significant drawback of this method, namely, the potential for the quality of referrals to be compromised or limited (Gill, 2020).

Through the application of snowball sampling, additional respondents were identified, resulting in a final sample comprising 9 participants. The research methodology relied on 7 semi-structured interviews conducted with 8 key stakeholders, with a 9th respondent providing written answers via email, all chosen purposely to provide diverse perspectives on the research topic. As was previously mentioned, Hennink and Kaiser (2022) have posited that at least 9 respondents are required in qualitative research to reach saturation, and as this research ended with data collected from 9 respondents, it can be assessed that theoretical saturation was reached.

The details of the sampled respondents can be found below in Table 1. The majority of the sampled respondents were employees in development or technology units within their local governments. The respondents came from five different Estonian local governments. However, one respondent was a representative from a country-level non-governmental organisation that collaborates with local governments and provides support for them in a range of areas. The respondent was responsible for IT matters in the organisation, and therefore knowledgeable about the state of IT skills and data experiences within local governments. All respondents (R1-R9) and local governments (LG1-LG5) were given a code to ensure the anonymity of the respondents.

As was mentioned previously, in Estonia, local governments of different sizes have for example unequal socio-economic development rates. Therefore, the sampled

governments were also categorised based on their size. The European Union classifies towns with a population size between 5 000 and 10 000 inhabitants as a small town (Lecomte & Dijkstra, 2023). Medium towns have 10 000 - 25 000 inhabitants, and large towns have more than 25 000 inhabitants (Lecomte & Dijkstra, 2023). To not overcomplicate the analysis, in this research, small- and medium-sized local governments are grouped together, while large towns are considered on their own. As is displayed on the table, the final sample included five respondents from large-sized local governments, and three from small- to medium-sized ones.

Respondent Code	**Role**	**Local government type**	**Data collection date**	**Interview duration**	**Data collection format**
Respondent 1	Chief Data Officer	Large-sized (LG1)	27/02/2024	60 min	Semi-structured interview
Respondent 2	Project Manager	Large-sized (LG1)	28/02/2024	38 min	Semi-structured interview
Respondent 3	Head of Urban Management Department	Small- to medium-sized (LG2)	05/03/2024	26 min	Semi-structured interview
Respondent 4	Head of Geospatial Solutions	Large-sized (LG1)	06/03/2024	41 min	Semi-structured interview
Respondent 5	Head of Digital Services Subunit	Large-sized (LG3)	15/03/2024	54 min	Semi-structured interview

Respondent 6	Lead Specialist of Information Security				
Respondent 7	GIS Specialist	Small- to medium-sized (LG4)	27/03/ 2024	77 min	Semi-structured interview
Respondent 8	Representative from the Association of Estonian Cities and Rural Municipalities	NA	28/03/ 2024	50 min	Semi-structured interview
Respondent 9	Development specialist	Small- to medium-sized (LG5)	02/05/ 2024	N/A	Written answers

Table 1. Respondents

During the data collection phase, interviews were conducted, ranging in duration from 26 to 77 minutes, with an average length of 50 minutes. The variability in interview duration was attributed to the varying degrees of involvement of individual stakeholders in the projects under scrutiny. To transcribe the interviews efficiently, the transcription service provided by Microsoft Teams was utilised, generating automatic transcripts. However, to ensure the accuracy of these transcriptions, they were meticulously cross-checked against the original audio recordings. Furthermore, following the advice of McLellan et al. (2003) to capture every single word of an interview and to not reduce the text, all conducted interviews were transcribed verbatim. Additionally, to maintain confidentiality and data integrity, respondents' identities were anonymized and they were identified by codes.

The interview questionnaire was formulated based on the theoretical framework of the paper, and the questions were framed in an open-ended manner. The questions were structured along the following themes:

- **Part 1:** In the first part, the respondents were asked questions on their background, including their current position and tasks within the local government. They were also asked here, what role data plays in their daily work and tasks.
- **Part 2:** Here, they were asked questions on the digitalisation projects undertaken within and outside their local government, including the role played by data in the project. They were also asked about data sharing within their government, including the extent to which it happens and specific examples if possible (incl. with whom they have partnered and what kind of data was shared). This part also included questions about how open they are to sharing data with external partners, and which factors impact their openness.
- **Part 3:** Here, they were asked about the resources within their local government that are there to support data-related initiatives. The respondents were asked to provide insights into the current skills and capabilities within their local government related to data use and sharing. They were also asked to assess whether they believe that their organisation has enough people and competences to support data-sharing, and if not, what is lacking. This part also included

questions about the existence of specific training programs or initiatives in place to enhance data-related skills among municipal staff.

- **Part 4**: This part included questions about the resources within a local government that can be leveraged for data-sharing (e.g. dedicated positions, technological infrastructure, financial resources). The respondents were asked to reflect on any challenges in procuring the necessary resources.
- **Part 5:** To end the interviews, the participants were asked to reflect on what they think should be done within their government to enhance their ability to use data and participate in data sharing.

The interview guide for the representative from the Association of Estonian Cities and Rural Municipalities followed a different structure. The representative was asked to describe their role and the work of their association. They were also asked to describe the initiatives taken by their organisation to support the digital skills of local governments. The respondent was asked to evaluate, based on their expertise and knowledge, the data-related skills of Estonian local governments, and the factors impacting the skills. In the case of an absence or a lack of insights on a given question or topic, the interviews moved to other topics.

Ethical considerations

This research entails the collection of data from individuals through interviews which may include the sharing of highly personal information (Gorman & Clayton, 2004, p. 43). While the topic of this research is unlikely to lead to the sharing of highly personal information, a number of steps were still taken to ensure that ethics aren't compromised. Prior to the interviews, all interviewees were asked to sign a consent letter, which outlined the purpose of the research, how the data will be stored, ensured participants of confidentiality (use of pseudonyms), and informed them of their right to withdraw at any stage of the research. The consent form can be found in Appendix 1.

Data analysis

In this research, a qualitative thematic analysis was conducted on the interview transcripts. The initial coding scheme was developed from the theoretical background

using a deductive approach, guided by the extended TOE framework that was created for the purposes of this study. This initial deductive approach was chosen due to the availability of significant prior research on the topic, which facilitated the translation of the research objectives into specific categories. The software that was used for the analysis was Nvivo.

Thematic analysis is a method for analysing and interpreting qualitative data (Clarke & Braun, 2017). The purpose behind thematic analysis is to analyse qualitative data by identifying themes within it (Clarke & Braun, 2017). Both an inductive and deductive approach to thematic analysis exist. In this research, a deductive coding approach was first applied, utilising a preliminary codebook to guide the analysis. This initial codebook (which can be found below in Table 1) was developed based on the extended TOE framework, providing a structured starting point for coding the interview data. However, the coding process was also allowed to be more flexible and adaptive. While the initial codebook served as a valuable framework, the thematic analysis applied in this paper also remained open to identifying new codes and themes as they naturally emerged from the data.

This flexibility was important for capturing the full complexity and richness of the interview responses. By not adhering too rigidly to the initial codebook, it was ensured that important insights and themes that were not anticipated by the initial codebook could still be incorporated into the analysis.

Code	(Stipulative) definitions
Factor - Technology	Elements related to technological infrastructure, tools, and capabilities that affect data-sharing involving local governments.
Factor - Organisation	Organisational attributes, structures, and practices that influence data-sharing involving local governments.
Political and managerial leadership	The influence of political and managerial leaders of local governments in promoting and facilitating data-sharing involving local governments.
Factor - Environment	External factors and conditions that impact data-sharing practices in local governments.
Networking	The role and effectiveness of networking in facilitating data-sharing among local governments and other entities.
Trust	The level of trust among local governments and their data-sharing partners.
Knowledge management / Organisational learning	Practices related to managing and leveraging knowledge and promoting learning within the

	local government to support data-sharing.

Table 2. Initial codebook

Limitations of methodological choices

While this study aims to provide valuable insights into the factors influencing data-sharing in Estonian local governments, the chosen methodology also comes with several limitations. Recognizing these limitations is crucial for understanding the scope and applicability of the findings.

One potential limitation lies in the generalizability of the findings. As this study focuses specifically on Estonian local governments, the extent to which the results can be extrapolated to other contexts may be limited. Local contextual factors, such as cultural norms, political structures, and technological infrastructures, may vary significantly between different regions and countries, affecting the applicability of the findings.

The sample size and selection process for interviews may introduce bias into the study. Purposive sampling, while useful for capturing diverse perspectives, may not fully represent the entire population of stakeholders involved in data use and sharing within local governments. Additionally, participants' willingness to participate and their availability for interviews may introduce selection bias, potentially skewing the results.

The data collected through interviews relies on self-reported information provided by participants. This introduces the possibility of social desirability bias, where participants may provide responses that align with perceived expectations rather than reflecting their true experiences or opinions (Chung & Monroe, 2003). Furthermore, participants' recall accuracy may vary, potentially affecting the reliability of the data.

Next, the process of coding in thematic analysis is one of interpretation, whereby each person doing the coding may interpret the data in a different way (). Therefore, to increase the reliability of a research, more than one coder is generally considered better (Fugard & Potts, 2019, p. 7). However, as this study is a thesis research conducted by only one individual, this was not possible. Thus, despite efforts to maintain rigour and

transparency in the analysis process, the subjective nature of qualitative research introduces the possibility of researcher bias.

The results of thematic analysis aren’t necessarily generalizable to other individuals and contexts, and can often only be applied to the subjects that were analysed in a specific research (Fugard & Potts, 2019, p. 7)

Conclusion

In summary, this methodology section has outlined the case study approach, which will involve a detailed examination of the Estonian local governments' practices, policies, and experiences related to data use and sharing. This will include collecting and analysing qualitative data from interviews, and relevant case-specific documents. The case study will provide a holistic view, integrating multiple sources of evidence to construct a comprehensive narrative.

4. Results & Discussion

The findings of the case study will be presented as follows: in the first part, an overview of the current data sharing practices within the sampled Estonian local governments will be provided. Next, the factors impacting their data sharing and use will be expanded upon, categorised according to the extended TOE framework created for the purposes of this research. As was mentioned in the previous section, the thematic analysis employed in the research allowed for additional categories to emerge during the analysis of the interviews. Therefore, the description of the results will also include factors that have not been discussed yet in this paper.

Data-sharing experiences

Out of the five sampled local governments, four of them reported having engaged in at least some degree of data-sharing. The only one in which data-sharing did not occur, at least according to the respondent, was a small- to medium-sized local government.

The role of communication with data-sharing partners was also explored during the interviews. It was found that one of the key methods for maintaining such communication is through the use of digital platforms and regular meetings. As Respondent 1 explained, "*We use Slack for everyday quick questions, updates, comments, and so on. Emails are for official announcements like making deadlines and all the legal part through emails.*" This combination ensures that both informal and formal communications are well-documented and accessible, facilitating smooth collaboration.

Regular scheduled meetings are another essential component of effective communication. In one local government, bi-weekly meetings to provide updates and track progress were held. "*We had a scheduled meeting every two weeks [...] where we just made updates and [...] where we are, and so on*," shared Respondent 1 from a large local government. These meetings are crucial for maintaining alignment between partners, addressing any emerging issues promptly, and ensuring that all parties are on the same page.

The interviews also revealed the importance of responsiveness and adaptability in communication. Local governments need to be able to address technical issues, monitor data quality, and adjust their approaches, as necessary. Respondent 2 highlighted the need for daily communication to manage these tasks effectively, noting, "*It's needed daily communications [...]. You need every day to monitor data flow and data quality and be in touch with data providers.*"

Data-sharing occurs extensively within local governmental departments and with other governmental bodies. For example, within a large local government, different departments regularly share data. Respondent 1 highlighted, "*We do have a lot of systems that get data input from one department, and the users are in another department. Like the road data [...] the input is from one department, and the users are mostly like the other departments who oversee the quality of the road*." This internal data-sharing ensures that various departments have the necessary information to perform their tasks effectively.

The use of centralised systems like X-Road facilitates data-sharing between local governments and the central government. X-Road allows for automatic data exchange between different governmental systems, making it easier to maintain up-to-date information across platforms. As Respondent 1 noted, "*We do share data across X-Road. We [publish] our documents and get a lot of data from central systems like the central road system and the population register."*

However, challenges remain in ensuring seamless data exchange. Some governmental systems are not fully integrated, requiring manual updates and interactions. Respondent 4 from a large local government pointed out, "*The different registers are not built up this way that they can do this machine-to-machine data exchange* [...] *there's a limitation where we can grow in terms of sharing the data between government organisations."* This indicates a need for further development of interoperable systems to facilitate smoother data-sharing.

With regard to data-sharing involving private sector partners, the sampled local governments engage with various companies to enhance data-driven projects. One notable example from a large local government is the cooperation with Bolt, a scooter

operator. The city provided Bolt with data on pathway widths to improve scooter parking regulations. "*We gave them our road data set* [...] *they actually changed the parking permissions based on our own network,"* explained Respondent 4. This collaboration shows how sharing local governmental data with private companies can lead to practical improvements in urban management.

Nevertheless, data-sharing with private companies often encounters obstacles. Private entities may be reluctant to share data due to business confidentiality or the cost of data provision. Respondent 2 noted, "*Quite often they're not very intended to share data for different reasons, a business secret for example,* [...] *or they ask for money for this.*" To address this, local governments sometimes include data-sharing clauses in contracts with private companies, ensuring access to necessary data. "*In contracts, we are fixing certain terms on data sharing* [...] *this helps quite a lot*," mentioned the same Respondent 2.

Local governments also collaborate with academic institutions to support research and development. These partnerships are usually driven by specific project needs. For instance, a large local government's cooperation with universities involves sharing data for research on energy consumption and urban planning. "*We initiate the data-sharing when it's needed for certain purposes* [...] *but usually our data moves from our side to the private sector or universities*," explained Respondent 2. These collaborations help leverage academic expertise to address urban challenges.

International collaborations are another aspect of data-sharing, particularly in EU-funded projects. Local governments participate in projects that involve data-sharing with cities and companies from other countries. Respondent 4 from a large local government mentioned, "*Sometimes we do EU projects, and there are other cities represented* [...]*, and then we do this like international data exchange.*"

Despite these efforts, there are still areas for improvement. Ensuring that all local governmental departments communicate their data needs effectively is crucial. As Respondent 1 pointed out, "*Departments don't always communicate with each other about the needs* [...] *we are trying to do better at that*." Improved internal communication can help identify and bridge data gaps, enhancing overall efficiency.

Technological context

Technological infrastructure

The technological infrastructure in place varies significantly between larger local governments and small- to medium-sized ones. In larger local governments, there is a more developed and sophisticated technological infrastructure that supports comprehensive data management and sharing.

For instance, one of the large local governments has implemented several advanced systems to facilitate data handling. As Respondent 1 highlighted, "*We have our own server part, a metadata management system where we are storing the metadata and describing it and publishing it. We have a few softwares that make moving data easier.*" This infrastructure includes pipeline software that transforms and transfers data efficiently between systems. Additionally, one of the sampled large local governments uses a central platform for data storage, ensuring all data is held in one place and accessible based on user roles (Respondent 1).

Another key aspect of the same large local government's infrastructure is the development of a data warehouse. As Respondent 1 explained, "*We are making the data warehouse to collect all the data in one place so we can start making better dashboards and reports for people to actually use.*" This centralised data repository aims to streamline data access and improve decision-making processes by providing a consolidated view of data from various sources.

In contrast, smaller local governments face significant challenges due to less developed technological infrastructure. In one of the sampled small- to medium-sized local governments, for example, the reliance on state-provided systems like X-Road is more pronounced. Respondent 3 from a small- to medium-sized local government noted, "*It's good that the different databases are connected* [...] *but sometimes it should sync better.*" This reliance highlights the dependency of smaller municipalities on state-level infrastructure, which, while beneficial, may not always meet local needs perfectly.

Moreover, managing and maintaining these systems depends on the skills of municipal employees, which are usually lacking in smaller local governments. Moreover, finding a replacement when the key person leaves is difficult. For instance, a small- to

medium-sized local government's technological infrastructure includes a central database with map layers used for data entry and viewing (Respondent 7). They utilise ESRI ArcGIS Pro and web maps on the intranet to manage and visualise data. However, the local government faces challenges with maintaining and upgrading their server infrastructure. As Respondent 7 mentioned, "*We must upgrade our server and do things differently because the guy who [...] knew everything left, and the new guy don't know anything about it.*" This situation underscores the importance of continuity and knowledge transfer in maintaining robust technological infrastructure.

In terms of what influences the choice of which technology is procured, it was revealed that the choice of infrastructure in local governments is often influenced by both internal needs and external regulations. In one large local government, for example, decisions about technological infrastructure involve team discussions to ensure safety and reliability. Respondent 1 explained, "*We work in our team to make sure that software things we choose are safe, are reliable.*" However, larger expenditures require following public procurement processes, which can add complexity and delay to the implementation of new technologies.

Another important aspect of technological infrastructure is its role in data-sharing. One sampled large government uses ArcGIS Hub for sharing most data, making it publicly available and easily accessible for research purposes. They also employ direct channels and cloud environments for sharing data that is not publicly available. Respondent 2 from a large local government noted, "*ArcGIS is a main channel where we are sharing data*." This centralised approach facilitates efficient data distribution and access.

The centralization of data management systems also plays a crucial role in internal data-sharing. For example, one of the large local governments has a central platform where all data activities are logged and managed. This system allows for role-based access, ensuring that sensitive data is protected while making non-sensitive data readily accessible to all city employees. Respondent 4 explained, "*We have a central platform [...] and everyone has access based on their user role. For example, if the data is more sensitive then the role is more narrow and not everybody can access it directly. But if the data is not so sensitive, it can be accessed by everyone who's working in our*

government, so the city workers basically can access all the data that is collected in different departments."

Technological skills of staff

One of the key themes emerging from the technological skills of staff is the significant variability in technological skills across different local governments and departments. In larger local governments, there are dedicated teams and roles focused on data management and cybersecurity. For example, Respondent 1 from a large local government mentioned, "*We have a team for the public service development team. That includes me, our cybersecurity official, our data security official, and some public service development leads for like project management*." This structured approach allows for specialised skills and capabilities to be developed within specific roles, ensuring a higher level of expertise in data management.

However, even within these larger local governments, there are gaps in skills and capabilities. Respondent 1 also stated that "*it is kind of lacking or in a bad state by the data owner. But we do not have a lot of data owners. Some are better than others, some do know everything about their data that they can manage, but some are not.*" This inconsistency suggests that while there are specialised roles, not all data owners possess the necessary skills to manage their data effectively.

In contrast, smaller local governments often face significant challenges due to a lack of specialised staff and resources. Respondent 3 from a small- to medium-sized local government stated, "*I believe our capabilities are not enough for data sharing*." The respondent further explained the difficulty in keeping data up to date due to the infrequent engagement with data by staff. This highlights the need for more frequent and targeted training to ensure that data remains current and accurate.

One of the critical skills identified by respondents is the ability to comply with data protection regulations such as GDPR. Respondent 2 emphasised, "*It's very important to understand and be familiar with GDPR requirements. And it's very good if people have at least some level of analytical skills.*" These skills are essential for ensuring that data is handled legally and ethically, and for deriving meaningful insights from the data.

Despite the importance of these skills, there is often a significant gap between the skills required and the skills possessed by staff. For instance, Respondent 6 from a large local government noted, "*The skills are very variable. There are departments where people are very data-minded and have the skills to use and produce data, and there are many departments where skills lie elsewhere.*" This variability can create barriers to effective data-sharing and management, as not all departments are equipped to handle data in the same way.

Training and professional development are crucial for bridging this skills gap. However, logistical and financial constraints often limit the availability of such training. Respondent 7 from a small- to medium-sized government mentioned, "*The training is quite expensive, and so we must think every time to offer it or not.* [...] *If the group size is not sufficient, it takes time for the group to fill up*." This delay can mean that new employees do not receive timely training, impacting their ability to perform their duties effectively.

Moreover, the turnover of specialists further complicates the situation. Respondent 7 from a small- to medium-sized local government stated, "*a big problem is the change of specialists, i.e., high staff turnover. You just manage to train one when they're already gone and a new one comes who has to be trained again from the beginning*." This continuous cycle of training and turnover can strain resources and reduce the overall effectiveness of training programs.

There is also a need for more positions dedicated solely to data management and analysis. Respondent 1 from a large local government mentioned, "*we really need more data analysts because there is a lot of non-location data that have owners that do not have the capabilities to describe it, analyse it, and put together reports.*" Having dedicated analysts can significantly enhance the capacity of local governments to manage and utilise their data effectively.

Organisational context

Organisational structure

Tangi et al. (2021) have identified organisational barriers (including a lack of departmental support and coordination between departments) as the main obstacles to digital transformation in public sector organisations. While this research does not seek to classify the identified factors according to their importance, it did find a number of organisational factors impacting the ability of Estonian local governments to engage in data-sharing. More specifically, insights on how organisational structure, specifically roles and responsibilities, impacts data-sharing were gained during the interviews.

A recurring theme in the organisational context is the necessity of clearly defined roles for data handling. In many cases, the obligation to manage data is not explicitly stated in job descriptions. Respondent 7 noted, "*it's not always clearly written that they must manage this data. We must talk again and again.*" This lack of clarity can lead to inconsistencies in data handling and delays in data updates. When key personnel leave, their responsibilities might be distributed among remaining staff who may lack the enthusiasm or expertise to handle these tasks effectively, exacerbating the problem.

In larger local governments, the organisational structure is more developed, with distinct roles and departments dedicated to various aspects of data management. For example, one large-sized local government is divided into different units or organisations, as Respondent 1 explained, "*the local government is divided up into different units or organisations, so they have a lot more people and power*." This division allows for specialised roles that collectively ensure a more comprehensive approach to managing and utilising data.

Financial resources

The allocation of financial resources for supporting data-sharing and data-related initiatives was a significant theme in the interviews. Financial resources are crucial in ensuring that municipalities can effectively manage and utilise data, yet the availability and allocation of these resources vary widely.

Local governments often have to compete for limited financial resources, prioritising them against other essential needs. As Respondent 1 explained, "*we have to ask for the*

money for next year and explain why we need it. The city government will then look over the finances and choose carefully on what we can spend money on." This competitive allocation process means that only the most critical and well-justified data initiatives receive funding.

One of the significant challenges highlighted is the high cost of data management solutions. As Respondent 1 from a large local government noted, "*I managed to get the data management stuff when it was just taking off, so I got the licence at an early age when it cost less. Now it costs €16,000 a year, and for smaller municipalities, even €20,000 a year is a lot of money*." This highlights the financial burden that data management solutions can place on smaller local governments, which often lack the budgetary flexibility to absorb such costs.

Moreover, the limited financial resources also impact the ability to hire specialised personnel. Respondent 3 from a small- to medium-sized local government pointed out, "*our financial resources are not very good. If finance is needed, we have to think and see what the benefits are. It's quite difficult often to participate in different activities.*" The scarcity of financial resources often means that local governments cannot afford to hire the necessary staff, further hampering their data management capabilities.

However, not all local governments face the same level of financial constraints. Some have found ways to integrate data-related funding into their regular budgeting processes. As Respondent 4 from a large local government noted,

> "*every department has to have some kind of a money taken into account to their budget. And there's also, like City Council budget that has provided for the different data updates or data infrastructure updates and this is done like regularly and it's in our strategic plan also. So it's like yearly updated and looked through how much money do we need, do we need in some places more some places less and it's also related to the software wise that we put down, or it is not used anymore some software and take into new software.*"

This proactive approach ensures that data management and sharing are continually supported.

Despite these efforts, financial challenges remain a significant barrier. In some cases, the financial resources allocated for data initiatives are project-specific rather than part of a regular budget. "*In most departments, it's not a regular part of the budget but for some kind of project*," explained Respondent 6 from a large local government. This project-based funding model can lead to inconsistencies in data management practices and long-term planning.

The interviews also reveal that financial constraints affect employee retention, particularly in IT roles. Respondent 7 from a small- to medium-sized local government highlighted the issue of low salaries, stating, "*Our salaries are so low. IT people left because of salary. They go to private companies where they get twice as much.*" This salary disparity between the public and private sectors makes it challenging for local governments to attract and retain skilled IT personnel. This can be linked to Panagiotopoulos et al.'s (2023) research, where they highlighted the importance of continuity in human resources to be important for digital transformation within the public sector.

Internal communication

In the results subsection on data-sharing experiences, communication between data-sharing partners was discussed. Next to this type of communication, internal communication within local governmental departments was also highlighted by the interviews. Effective internal communication in managing and sharing data within municipal departments is also of key importance.

One key issue identified is the need for robust internal data management systems. As Respondent 2 from a large local government emphasised, "*people need to know where data is located and in what format [...] a basic understanding of where you can get internal data is most important*." This suggests that ensuring all staff are aware of data locations and formats is crucial for smooth data operations.

Despite this, there are challenges associated with coordinating data across different departments. Respondent 5 from a large local government mentioned,

> "*a lot of information is gathered into files and shared as files between participants. That's the part we need to probably work on. How to* [...] *coordinate that the information ends up somewhere we can share it more easily* [...] *or maybe use tools to make it more accessible to everybody without understanding where it actually is*".

This indicates a need for better structuring and tool usage to streamline data-sharing and ensure that information is easily accessible to those who need it.

Over the years, one local government had identified an improvement in awareness and communication among departments. Specifically, Respondent 6 from a large local government noted, "*it used to be that we didn't even know some data exists. Now, people know more that it helps to ask from us also maybe to analyse something before doing something with data or just ask how it could be better done.*" This shift demonstrates a growing recognition of the importance of data management and the benefits of seeking expertise within the local government.

However, the smoothness of data-sharing varies across departments. Some departments have strong data analytics capabilities, while others are still developing. As Respondent 5 from a large local government put it, "*we have quite a few departments that have very strong data analytics teams or people and a few that are in a poor situation*." This disparity highlights the need for a more uniform approach to data management and sharing across all departments.

Governance and strategic management play vital roles in facilitating better internal communication. The creation of a strategic management office in one of the two sampled large governments aims to support collaboration between different departments. As Respondent 6 from a large local government explained, "*the strategic management office was created to offer support for all departments [...] sharing between our departments is getting better all the time.*" This centralised support helps

bridge the gaps between departments and fosters a more cohesive approach to data management.

Moreover, there are ongoing efforts to improve data governance and analytical skills within local governments. Respondent 5 from a large government emphasised the need to "*understand our own information better, and then we can acquire information better and also share information better inside ourselves and also to the external parties.* [...] *and then just like the analytical skills that we need to like increase.*"

Size of municipality

The results of this research suggest that data-sharing is more in place in larger local governments, while small- to medium-sized ones face significant difficulties in participating in data-sharing. Smaller local governments face considerable difficulties in managing and sharing data due to limited resources. Unlike larger local governments, which have dedicated IT departments and personnel, smaller local governments often rely on a single individual who handles multiple roles, including data management. As Respondent 2 from a larger local government mentioned, "*but in smaller municipalities, it's more complicated because usually, they don't have some kind of IT departments [...] maybe one person who is dealing with this [...] it's quite a big headache*."

This lack of resources extends beyond personnel to financial limitations. Smaller loca governments, such as those with populations around 10,000, cannot afford to hire specialised staff for every aspect of local governmental operations. This results in a significant disparity in data management capabilities compared to larger local governments. As Respondent 3 from a small- to medium-sized local government explained, "*It's understandable that a small city can't have a person for everything* [...] *Tartu can afford a lot of people working in different fields, but a 10,000-inhabitant town can't.*"

Furthermore, data awareness and skills are notably lower in smaller local governments. The broader understanding of IT, including data management, is often limited to basic functional needs such as maintaining internet connectivity and hardware. This gap is exacerbated by a lack of prioritisation of IT and data issues. Respondent 8 from the national level association noted, "*data itself is not very well acknowledged at this point;*

only bigger cities do it. They have personnel that are daily dealing with data topics, but that's not the case for most of the municipalities." This limited awareness and skill level mean that smaller local governments often do not engage in data-related activities or improve their data infrastructure.

The autonomy of local governments in Estonia further complicates efforts to standardise data management practices. Each local government operates independently, which can lead to fragmented approaches to IT and data-sharing. This autonomy sometimes results in resistance to cooperative initiatives, as local governments prefer to maintain their own systems and processes. Respondent 8 from the national-level association highlighted this challenge by saying, "*They have in some areas very broad rights to do whatever they want to do or how to do. And IT is one of these fields, this digital field, is something that they have freedom to do whatever and I think that could be one of the reasons why it's so hard to get them to cooperate.*"

Given these challenges, some respondents suggested that higher-level mandates or legislation might be necessary to encourage more consistent data practices across local governments. The idea is that state-level requirements for cooperation or unified information systems could help bridge the gap. Without such mandates, voluntary cooperation remains difficult, as illustrated by Respondent 8 from the association of local governments who mentioned, "*we have tried to do this cooperation from the association part. But it has been very, very difficult as there are 79 of them. Then there's always someone who said that oh, I don't want this or I don't want that.*"

In some very small local governments, where populations are extremely low, data management and IT might not be seen as priorities at all. For these areas, delegating certain functions to regional or county-level organisations could be a viable solution. This approach would allow for better resource utilisation and more effective data management practices. For example, Respondent 8 from the association suggested, "*maybe some functions could be delegated to a higher level, maybe regional level [...] because in many counties in Estonia, we have regions and counties, and there are some cooperation organisations on the county level too.*"

Larger local governments do engage in resource and practice sharing with smaller governments to some extent. However, the scale differences often mean that smaller local governments do not fully utilise or even request these shared resources. As Respondent 6 from a large local government mentioned, "*I think that we share a bit less with smaller municipalities because just the scales are so different that they often do not even ask but we have certainly for example, several information systems projects, where actually we share the results with them so that they can use this for their own information systems.*"

Past research has almost unanimously found that the size of an organisation plays a significant role in digital transformation efforts and innovation adoption (Baker, 2012, p. 234). However, while the majority of prior studies have agreed with the findings of this study, suggesting that smaller organisations face more challenges in adopting new technologies, Tangi et al.'s (2021) findings reveal that smaller organisations may actually find it easier to achieve DGT. This is due to their lower incidence of organisational barriers like coordination issues and lack of support, which makes the transformation process more straightforward for smaller entities.

However, the result of this study fall more in line with those studies suggesting that small organisations face more issues, due to a shortage of key resources such as personnel and finances, hindering the ability of small- to medium-sized local governments to participate in data-sharing.

Role of employees

An organisational factor impacting data use and data-sharing within Estonian local governments that was recurring throughout interviews was the role played by local government employees.

A common theme is the disparity in skills and attitudes between different generations of employees. Younger employees tend to be more adaptable and understanding of data's importance. As Respondent 4 noted, "*the younger generations don't have any limitations. They understand more and they are more like flexible in doing new things.*" Conversely, older employees often do not realise the value of the data they produce and

its potential impact on other applications and analyses. This generational gap presents a challenge in fostering a data-centric culture across the board.

According to an OECD (2023) report on Estonia, younger people tend to migrate towards urban areas, leading to a decrease in the development of non-urban areas. This may further complicate the challenges faced by small- to medium-sized Estonian local governments, as the people who tend to understand the importance of data move away towards urban centres.

Another already-mentioned critical issue is the shortage of dedicated personnel for data-related tasks. Respondent 7 from a small- to medium-sized government highlighted the struggle of handling numerous responsibilities alone, stating, *"A huge part of these things I'm doing all by myself. So it is tough."* This lack of manpower hampers the efficiency and effectiveness of data management and sharing processes. The absence of sufficient staff also affects the ability to implement and maintain data strategies, which are crucial for achieving long-term goals in data utilisation.

The interviews also underscored the importance of problem formulation in data-driven decision-making. Respondent 4 from a large local government explained, "*We are lacking the ability to formulate a problem so that we can provide an answer based on data. If we know what kind of problem we are trying to solve, it's really easy to find different kinds of datasets and provide analysis.*" Clear and specific problem definitions are essential for leveraging data effectively, yet this remains an area where many local governments struggle.

Employee attitudes towards data-sharing also play a crucial role. It was noted that the willingness to communicate and collaborate is vital. As Respondent 4 put it, "*by the end of the day, it's just about the people. Do they want to communicate? If they don't want it, it's really hard.*" This highlights the need for intrinsic motivation and a proactive attitude among employees to foster a collaborative environment for data-sharing.

Moreover, it links to a point made previously, where a dedicated team is needed to deal with data-related topics and strategies. Related to this finding, Wilson and Mergel (2022) have referred to “digital champions”, i.e. individuals within an organisation who

drive digital transformation through their actions. Digital champions use cultural strategies to get rid of cultural and structural barriers in their organisations (Wilson & Mergel, 2022). Such cultural strategies include, for example, promoting knowledge sharing, transferring knowledge between their peers and other organisations, networking with the private sector, etc. (Wilson & Mergel, 2022).

Data governance and the understanding of data's role in everyday tasks are other important aspects. One interviewee emphasised that employees should acknowledge the importance of their work in generating quality data without being overly focused on data itself. "*It shouldn't be like you have to deal with data now, but you do what you do and do it good, and we may make data out of it,*" Respondent 4 explained. This approach helps integrate data awareness into routine activities without overwhelming employees.

The issue of timely data updates by local government employees was also mentioned, particularly in smaller governments. Respondent 7 from a small- to medium-sized local government noted, "*Sometimes I see there is nothing for two months or half a year or something*." The reluctance to update data promptly affects its usability and reliability, causing frustration for those who depend on it. This can be linked to the fact that in small local governments, employees tend to have few IT-related skills, which also makes it difficult and reduces the employees' desire to perform these operations.

Managerial leadership and support

Related to the role of employees is that of the local government leadership. According to the interviews, effective leadership plays a vital role in fostering a data-driven culture and ensuring that data-related initiatives are prioritised and adequately supported. Leaders need to push for changes and encourage a more proactive approach to data management. "*It needs a bit like shaking and maybe from the part of the leaders, of course, the managers. They can, I think, change the system, but in often cases to them, it is also more convenient kind of system*," Respondent 8 remarked. Effective leadership can bridge the gaps in skills and attitudes, promoting a more cohesive and efficient data-sharing environment.

One recurring theme is the need for higher-level reinforcement to ensure that data management responsibilities are taken seriously. As Respondent 1 emphasised, "*the data owners haven't been data owners before; they have just used the data. Now they have responsibilities and the new role, so they don't understand why it's necessary or don't want to do it*." This underscores the importance of clear communication from leadership to ensure that all employees understand their roles in data management. Reinforcement from higher-ups can help accelerate this process, making it clear that data management is a priority for the local government.

In some local governments, there is recognition that the local government must take a pioneering role in data sharing. Respondent 2 noted, "*municipalities must be leaders and pioneers here. And it's understandable, this is a public body basically and they must also serve citizens and businesses and it's very important to share data about what is available [...] it's a benefit for businesses and research*." This sentiment highlights the broader societal and economic benefits of effective data-sharing, which can only be realised if local governmental leadership prioritises and champions these efforts.

Leadership support extends beyond only endorsement; it also involves providing the necessary resources. This includes budget allocations, hiring specialised personnel, and investing in technological infrastructure. Respondent 4 from a large local government pointed out, "*It's well understood by department heads and politicians that [data-related activities] need support in financial things. So it hasn't been hard to get money to make better solutions or this kind of new platforms or infrastructure updates*." This proactive approach to resource allocation is essential for sustaining data initiatives.

Moreover, leadership's role in fostering a supportive environment for employees is critical. Encouraging participation in training opportunities, conferences, and other professional development activities can enhance employees' skills and knowledge. "*The most important is the supportive role of the employees [...]. So they like support their everyday workload and help them with different kind of training opportunities,"* noted Respondent 4 . This investment in human capital ensures that employees are well-equipped to handle data-related tasks effectively.

In some cases, the willingness to embrace data initiatives and the associated benefits varies among different leaders. As Respondent 8 highlighted, "*Sometimes it's because of money, sometimes it's because of time* [...] *if the people who are managing know about the possibilities and benefits, they will participate more.*" This indicates the need for continuous awareness and education among leaders to ensure they understand the strategic importance of data initiatives.

The role played by managers or local government leaders can be linked to Panagiotopoulos et al.'s (2023) research, where they highlighted the role of civil servants who have a combination of ITC skills and managerial skills, driving digital transformation within their organisation. Baker (2012, p. 234) has claimed that effective leadership from top management plays a crucial role in cultivating an environment that embraces change and backs innovations aligning with the firm's fundamental goals and vision. This involves articulating the significance of innovation in the broader organisational strategy, highlighting its importance to employees, and recognizing and incentivizing innovative efforts.

Training of employees

From the respondents it became apparent that training is recognized as a crucial component for improving data capabilities, yet the availability and scope of these programs vary significantly across local governments.

One of the primary observations is the general lack of comprehensive training programs in some local governments. For instance, Respondent 1 from a large local government noted, "*We are planning to [...] we are still doing the first part of the framework, the describing and the overview, but when we get that done and when there's a data warehouse, we will start teaching people how to make their own reports.*" This indicates a forward-looking approach where training is planned to coincide with the development of data infrastructure.

Some local governments have made progress in offering training courses, particularly online. As Respondent 2 mentioned, "*We have internal such courses, online courses for example, in terms of data management, security, and GDPR. These are mandatory for all employees*". This approach ensures that all staff members, regardless of their direct

involvement with data, have a basic understanding of essential data practices. However, the same respondent acknowledged that while the organisation is making good progress, there is still a need to recognize the value of data more broadly among staff.

In smaller local governments, the scenario is quite different. For example, a respondent from a small- to medium-sized local government said, "*No, no we don't,*" (Respondent 3) when asked about existing training programs for technical skills. This lack of structured training poses significant challenges for local governments trying to keep pace with evolving data-related practices.

In some local governments with some level of training, the programs are need-based and focused on specific applications. Respondent 4 from a large local government explained, "*We have the training mostly done by needs. For example, if we are implementing a new application, then we're making an internal training for using this application and explaining where the data comes from, what is the output, and how they can use it in their everyday work.*" This tailored approach helps ensure that training is directly relevant to the employees' tasks, making it more effective.

However, there are logistical and financial challenges associated with training programs. In one of the small- to medium-sized local governments studied, the cost and logistics of organising training can be too high as was already mentioned (Respondent 7). This can mean that new employees may not receive timely training, impacting their ability to perform their duties effectively.

Moreover, the budget allocated for training is often insufficient to cover the high costs of specialised training programs. As Respondent 7 mentioned, "*If you have only €230 a year for training, you can't get training that costs €600.*" This financial constraint means that staff may not receive necessary training, or it may consume their entire annual training budget, leaving no room for other learning opportunities.

Another challenge is the variability in the effectiveness of training programs. Respondent 4 from a large local government pointed out that the effectiveness of training increases when it is narrowly focused on specific tasks and outputs: "*The narrower the thing you are training on, the more effective it is. If you have a very*

wide-spectrum training, the effect is slower". This insight highlights the importance of targeted training that directly addresses the specific needs of employees.

Overall, while some local governments have made strides in developing and implementing training programs, significant gaps remain. The disparity in resources, both financial and logistical, between larger and smaller local governments creates uneven access to training. Additionally, the need for standardised digital skills and a broader appreciation of data's value are critical areas that need addressing.

Knowledge management and Organisational learning

Organisational learning as a factor was not highlighted significantly during the interviews, possibly indicating a lesser role than some of the other factors. However, some respondents did discuss learning from past experiences. In one large local government, for instance, a structured retrospective process is employed after data projects. As Respondent 4 noted, "*We do this retrospect after every different project so we can see whether it was a good decision or how can next time we do something better.*"

This reflective practice ensures that lessons learned are identified and acted upon, allowing for the refinement of internal and outsourced systems. By consistently evaluating and documenting the outcomes of data projects, local governments can make informed decisions that enhance efficiency and effectiveness. Moreover, this aligns with the concept of procedural memory as described by Moorman and Miner (1998), where organisational routines and formal procedures embody the memory of the organisation.

Documentation plays a pivotal role in organisational learning. By recording the details of each project, local governments create a valuable repository of knowledge that can be referenced for future initiatives. As the same respondent mentioned, "*We are always doing that basically just to make things better*" (Respondent 4). This commitment to documentation helps ensure that insights and best practices are not lost but are instead integrated into the organisation's collective knowledge base.

Moreover, the practice of sharing insights within the organisation is crucial. It facilitates a culture of transparency and continuous learning, where employees are encouraged to

contribute to and benefit from the collective experiences of their peers. Respondent 4 from a large local government emphasised the importance of this practice, saying that they document all projects. This approach not only enhances individual learning but also fosters a collaborative environment where knowledge is openly shared and utilised.

However, the extent of organisational learning varied among the studied local governments. Some have more established processes and a proactive approach to learning, while others may struggle with resource constraints and limited engagement from staff. The presence of proactive individuals who drive these initiatives can significantly impact the effectiveness of organisational learning. As was already mentioned, one respondent pointed out, the willingness to engage in these practices often depends on the presence of active and motivated personnel.

Environmental context

Networking and collaboration

The interviews reveal that while there are existing networks and collaborative efforts, challenges remain in achieving comprehensive and effective cooperation across all local governments.

Respondent 1 highlighted the existence of a study group facilitated by the Ministry of Economy and Communication. "*There's a study group or focus group that* [...] *I think there's every month, where they talk with different topics and try to explain and tell the other ones.*" However, despite these efforts, smaller local governments often find it challenging to keep up due to their more basic data management stages: "*But then for some smaller ones, it's not really that much effect because they are so far along and we are there*" (Respondent 1). This gap highlights the need for tailored support to ensure that smaller local governments can also benefit from such collaborative platforms.

While there are no specific networks dedicated solely to data, broader collaborations exist, particularly with academic institutions like the University of Tartu. Respondent 2 noted, "*We have collaboration with Tartu University, targeted mostly on mobility data."* This kind of targeted collaboration underscores the potential for academia to support local government data initiatives, providing expertise and resources that might otherwise be unavailable.

Some local governments of similar sizes also communicate and share experiences. However, there is a significant opportunity for more structured collaboration. "*We usually communicate with same-size municipalities, and everyone works out something on their own. It would be good if we could collaborate more, perhaps hire one specialist for several municipalities*," suggested Respondent 3 from a small- to medium-sized local government. This idea points to the potential benefits of pooling resources to tackle common challenges collectively.

Conferences and informal gatherings often serve as platforms for exchanging ideas and practices. Respondent 4 mentioned, "*[in] small conferences, we can share something that what are we doing and what are they doing but there is like no this kind of community engagement actually that we are like trying together to find the better solutions for cities."* This informal approach, while valuable, lacks the systematic and continuous engagement needed to drive significant improvements across all local governments. Yet, Wilson and Mergel (2022) have acknowledged the importance of transferring knowledge between peers and organisations by leveraging personal connections. They have identified that such knowledge sharing can also positively contribute to cultural change within public sector agencies.

The role of the central government and organisations in facilitating collaboration is also crucial. Respondent 8 from the association emphasised the importance of networking facilitated by state-level bodies, *"We have networks of the representatives of local governments and working groups that arrange seminars and information days."* These efforts aim to keep local governments informed about the latest developments and provide training opportunities.

Efforts to bridge these gaps include pilot projects that, if successful, encourage broader adoption. *"We had a pilot project for a unified website portal. Initially, five local governments adopted it, and now 35 want to join," s*hared Respondent 8 from the association of local governments. This success story illustrates the potential for well-executed pilot projects to drive broader collaboration and standardisation.

Central government support

The interviews reveal the role of central government support in enhancing data-sharing capabilities. One of the primary issues highlighted is the guidance provided by the central government, which, although present, often falls short of being fully effective. As Respondent 1 from a large local government noted, "*There are some instructions on how to set up the X-road server and manage the queries, but it is not good enough yet.*" This lack of comprehensive guidance leads to inefficiencies, as local governments frequently have to reach out to system owners to understand how to access or close data queries, making the process time-consuming.

Moreover, the outdated legal framework governing data systems poses another critical challenge. The process of registering systems to share data via X-Road is hindered by laws that have not been updated to reflect current technological and operational realities. Respondent 1 pointed out, *"The legal part is so old that the systems just don't comply anymore* [...] *and [the central government] needs to update the laws to today's state of things."*

This discrepancy between the regulatory framework and the practical needs of local governments creates significant barriers to effective data sharing. This can be linked to prior literature which has also found that laws and regulations can either stimulate or hamper inter-organisational data-sharing (Yang & Maxwell, 2011). On the one hand, they can facilitate for instance trust development between data-sharing partners by providing guidance on how to safely share data between actors. On the other hand, laws and regulations may hamper information sharing through for example policies that prohibit the sharing of data deemed as sensitive (Yang & Maxwell, 2011).

The central government has made efforts to facilitate data-sharing through initiatives like the Digital Academy, which offers online courses on IT topics. However, the uptake of such resources has been limited, partly due to the older demographic of local government personnel who may not be as inclined to engage with digital learning platforms. As Respondent 8 mentioned, *"as the overall age of the local government personnel tends to be like more older, then probably the usage of these kind of online courses is not like something like yeah, I will try it."*

Additionally, the central government's initiatives sometimes do not align with the immediate needs of smaller local governments. An example cited by Respondent 1 involved a focus group discussing AI and chatbots, which seemed disconnected from the pressing challenges of smaller local governments: *"Some guy from a small municipality said that's cool and all, but we are still struggling with describing our data"*. This illustrates a gap in communication and understanding between the central government's strategic initiatives and the practical needs at the local level.

Despite these challenges, there is recognition that the central government has made significant contributions, particularly in maintaining national databases that are crucial for local operations. The Land Board and Building Registry, for instance, are well-regarded for their functionality and accessibility. Respondent 3 from a small- to medium-sized local government acknowledged, "*Estonian databases like the Land Board and the Building Registry are quite good and easy to use for small municipalities.*" This indicates that while there are areas for improvement, the central government's role in supporting data infrastructure is valuable and appreciated.

However, there is a call for more cohesive and integrated support. The fragmented nature of ministries and their communication issues often hinder effective cooperation with local governments. As Respondent 4 pointed out, "*One ministry doesn't communicate with the other ministry, and now they want to cooperate with small local governments. I think they're not there yet*". This suggests that improving internal coordination within the central government could significantly enhance its ability to support local governments.

Trust

A significant aspect of trust concerns the sensitivity of data being shared. As Respondent 7 pointed out, "*If the data is such kind of data that nothing happens if the others have them, then there is no reason to trust or not trust.*" This perspective underscores that trust issues predominantly arise when dealing with sensitive or private data. When data is not sensitive, local governments are generally more open to sharing it without extensive trust considerations. However, for sensitive data, trust becomes paramount to ensure that the information is handled responsibly and securely.

Trust in the quality and accuracy of data is another critical element. Local governments need to have confidence that the data they receive from other entities is reliable and accurate. One respondent emphasised the importance of verifying data quality, noting that the lack of standardised procedures can lead to inconsistencies (Respondent 4). This issue is particularly pertinent in small- to medium-sized local governments where resources for rigorous data verification may be limited. Ensuring data accuracy and quality is fundamental to building and maintaining trust in data-sharing partnerships. The importance of data quality, including its accuracy, timeliness and completeness, has previously been underscored by Sutherland and Cook (2017).

Building and maintaining trust in data sharing is not without challenges. One of the primary hurdles is the fragmentation of responsibilities and the lack of dedicated resources in many local governments. This fragmentation can lead to inconsistencies in data practices and undermine trust. Respondent 7 from a small- to medium-sized local government expressed frustration over outdated data, saying, "*We had good data, but now there is nothing up to date.* [...] *[It impacts[my job and I think others' jobs also*." Such issues highlight the need for consistent and reliable data management practices to build trust.

Recommendations for the future

At the end of each interview, respondents were asked to reflect on what they think should be done in the future to increase their organisation's capacity to engage in data-sharing and effective data use. Their recommendations address key areas such as funding, dedicated personnel, data quality, training, and awareness, reflecting a comprehensive approach to improving local government data practices.

The necessity of having dedicated personnel for data management is a recurring theme. Respondents stressed that having specific roles focused on data-related tasks is essential for maintaining high data quality and ensuring effective data-sharing. As Respondent 2 from a large local government mentioned,

> "*And you need to have at least one dedicated person in your team in smaller municipalities and in municipalities like Tartu or bigger I guess maybe three, four, five dedicated persons who are making analytics and*

then responsible for data sharing and then therefore giving value to data and then building those dashboards. [...] *I see urgent need for this already today.*"

This approach ensures that data management is not a secondary task but a primary responsibility, enabling more efficient and accurate data practices.

Improving data quality was another significant recommendation. Respondent 4 pointed out the need to enhance the quality of data being entered into systems, suggesting the use of smart forms that pre-validate data entries to ensure consistency and accuracy. "*I think we should focus even more on the data quality so that the data quality is even better.* [...] *still some departments do a lot of hand work in terms of data entry, but I think giving them like really smart forms in order to do data entry oe the data updates, I think this would benefit the data quality*," Respondent 4 explained. This focus on data quality is crucial for making reliable data available for analysis and decision-making.

Training and professional development were also highlighted as critical components for improving data management practices. The need for regular, centralised training programs that cover essential aspects of data management, such as data security and GDPR compliance, was emphasised. Respondent 8 suggested, "*I think* [...] *central training courses could be one thing. The awareness-raising events. Networking of course. Maybe some kind of pilot projects about the data management or open data or something like that could be helpful*". These initiatives would ensure that local government staff are equipped with the necessary skills and knowledge to manage and share data effectively.

Another recommendation involved updating job descriptions to clearly spell out data management responsibilities. Ensuring that all employees understand their roles in data handling and management is vital for maintaining data integrity. Respondent 7 noted, "*This obligation must be clearly spelled out in job descriptions for everyone entering data*". Additionally, allocating training budgets specifically for data management, separate from general training funds, was suggested to ensure that adequate resources are available for this critical area.

Respondents also called for more collaboration and networking opportunities to share best practices and learn from other local governments. Pilot projects were recommended as a way to explore new data management approaches and demonstrate their value. "*Pilot projects about data management or open data could be helpful*", Respondent 8 stated, highlighting the potential for innovation through collaborative efforts.

In conclusion, the recommendations provided by interviewees point to a multifaceted approach to improving data management and sharing practices in Estonian local governments. Key areas of focus include securing dedicated funding and personnel, enhancing data quality through better data entry methods, providing regular and centralised training, updating job descriptions to include data management responsibilities, and fostering collaboration through networking and pilot projects. By addressing these recommendations, Estonian local governments could significantly enhance their data management capabilities, leading to more efficient and effective public service delivery.

The Figure 3 below presents the findings of the research, where factors from the technological, organisational and environmental context all contribute to impacting the ability of Estonian local governments to share data.

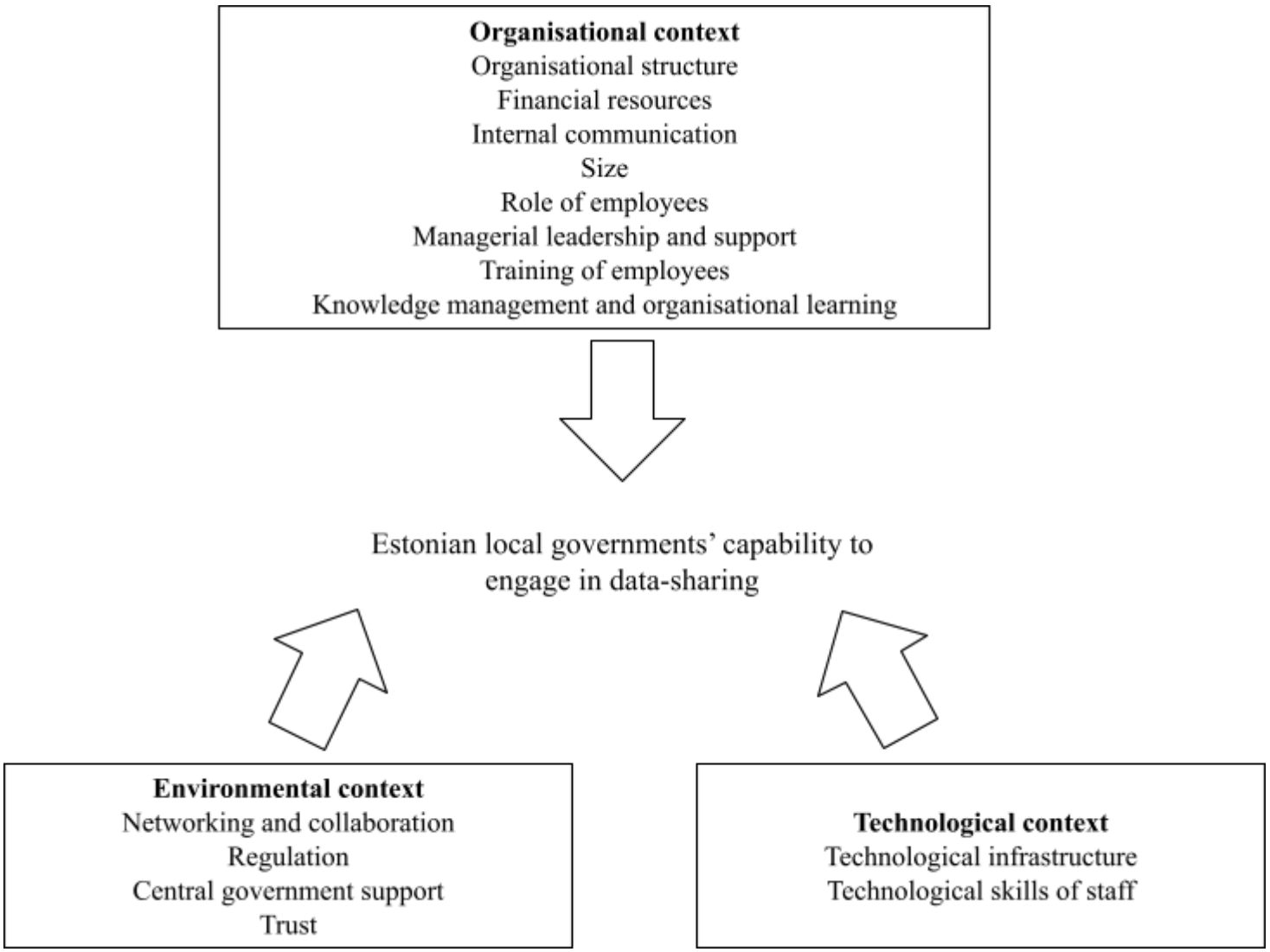

Figure 3. Factors impacting the capability of local governments to engage in data-sharing

5. Conclusion

This research set out to identify how factors from the internal and external environments influence the capability of local governments to engage in data-sharing. The exploration of data-sharing practices within Estonian local governments reveals a multifaceted landscape characterised by significant disparities in resources, technological capabilities, and regulatory support. The comprehensive analysis undertaken in this study underscores the critical role of various factors in shaping the efficacy of data-sharing and management across different local governments, ranging from large to small- and medium-sized Estonian local governments.

The findings uncover several key themes: organisational structure and roles, trust, training programs, technological readiness, regulatory support, and partnerships with public and private sectors. Each of these elements contributes uniquely to the overall data-sharing ecosystem, presenting both challenges and opportunities for improvement.

In addressing the research question—**how factors from the internal and external environments influence the capability of local governments to engage in data-sharing**—it is evident that these factors are deeply interwoven and collectively determine the effectiveness of local government data practices. Technological readiness, encompassing the availability of advanced infrastructure and digital tools, is crucial for facilitating efficient data management and sharing. Organisational factors, such as clear roles and responsibilities, training programs, and proactive leadership, ensure that data practices are systematically implemented and maintained. Environmental factors, including regulatory support and inter-organizational trust, provide the necessary framework and cooperation mechanisms for effective data-sharing.

A fundamental issue identified across local governments is the necessity for clearly defined roles and responsibilities in data management. Larger governments exhibit more developed organisational structures with distinct roles dedicated to data management, including data protection heads, data managers, and spatial data units. These specialised roles facilitate a comprehensive approach to data governance, ensuring accountability and systematic management practices. However, even within these structured environments, inconsistencies and gaps persist, highlighting the need for continual refinement and integration across departments.

In contrast, smaller local governments struggle significantly due to less formalised structures and limited resources. The lack of dedicated personnel often leads to fragmented data practices, resulting in inconsistencies and inefficiencies. This disparity underscores the critical need for strategic planning and resource allocation to bolster the data management capabilities of smaller local governments. Addressing these structural gaps is essential for creating a more uniform approach to data governance across Estonia.

The variability in technological skills among governmental staff significantly impacts data management practices. Larger local governments have made strides in developing comprehensive training programs, particularly online courses that cover data management, security, and GDPR compliance. These initiatives ensure that all staff members, irrespective of their direct involvement with data, possess a basic understanding of essential data practices.

However, smaller local governments face considerable challenges in implementing structured training programs due to financial and logistical constraints. This lack of training poses significant barriers to maintaining updated and accurate data. The disparity in training programs underscores the necessity for targeted and well-funded initiatives that cater to the specific needs of different local governments, ensuring that all staff are equipped with the requisite skills to manage and utilise data effectively.

Technological readiness varies widely among Estonian local governments, influencing their ability to manage and share data effectively. Larger ones have developed sophisticated technological infrastructures, including centralised data warehouses and advanced data management tools. These infrastructures support comprehensive data handling and facilitate efficient data sharing. In contrast, smaller local governments often lack the resources to develop such advanced infrastructures. Enhancing technological readiness across all organisations requires investment in robust and flexible infrastructures that support current and future data needs, coupled with continuous training and capacity building.

Regulatory support from the central government plays a pivotal role in shaping data management and sharing practices. However, the autonomy granted to local municipalities can lead to inconsistencies in data practices and challenges in fostering cooperation.

Efforts to standardise data management practices through regulatory directives can bridge the gaps between larger and smaller local governments. Mandating unified information systems and cooperative data management practices would ensure a more consistent approach to data governance. Strengthening regulatory frameworks to enforce cooperation and standardisation is essential for optimising data sharing practices across local governments.

Collaborations with public and private sector partners are crucial for enhancing data sharing practices. In the public sector, data sharing within local government departments and with other governmental bodies is facilitated by centralised systems like X-Road. However, challenges remain in integrating these systems fully to enable seamless data exchange. Private sector partnerships, such as Tartu's cooperation with Bolt, demonstrate the practical benefits of sharing local government data with companies to improve urban management.

Nevertheless, these collaborations often face obstacles, including reluctance from private entities to share data due to business confidentiality or costs. Establishing clear contractual terms for data sharing can mitigate these challenges and foster more effective collaborations. International collaborations, particularly in EU-funded projects, further enhance local data practices and contribute to broader knowledge sharing. These partnerships highlight the importance of cross-border data exchange in addressing urban challenges.

Despite these efforts, there are still areas for improvement. Ensuring that all departments communicate their data needs effectively is crucial. Improved internal communication can help identify and bridge data gaps, enhancing overall efficiency.

In conclusion, data-sharing in Estonian local governments involves a complex interplay between public and private sector entities, each with its own set of challenges and

benefits. Effective regulatory support, clear contractual terms, and robust technological infrastructure are essential for optimising these partnerships. By addressing existing challenges and fostering stronger collaborations, local governments can better leverage data to improve public services and urban management.

Sutherland and Cook (2017) found that the factors of the TOE framework do not operate in isolation, but rather influence each other. Indeed, the findings of this research confirm this interdependence, as the different factors influence each other. For instance, it was shown that the effective use of technologies required for data management and sharing in local governments, is strongly influenced by organisational culture and practices. Sutherland and Cook (2017) have also highlighted the interconnectedness between technical and organisational factors, arguing that addressing these challenges early on in the data lifecycle is of utmost importance. Moreover, understanding the interconnections between different factors can help local governments enhance and facilitate their data-related practices, so as to maximise public value.

While this study has made significant contributions to the existing literature on data sharing within local government contexts, it is important to acknowledge its inherent limitations. Primarily, these limitations stem from the constraints associated with a master's thesis project bound by a predefined timeline.

One notable limitation pertains to the specificity of the Estonian case study under examination and its subsequent findings. Consequently, the outcomes derived from this research cannot be readily applied to other contexts. However, it is worth noting that certain insights, such as the influence of resource constraints on data utilisation and sharing practices, most likely will hold relevance across diverse settings.

Another limitation of this study revolves around the relatively small sample size employed during data collection. The restricted number of participants or observations may limit the generalizability of the findings to a broader population or context. Consequently, caution must be exercised when drawing conclusions or making inferences beyond the sample of this research.

While the insights garnered from the study remain valuable within the specified context, future research endeavours could benefit from employing larger and more diverse samples from different countries to enhance the robustness and external validity of the findings. Moreover, an additional avenue for future research could be to apply comparative case-studies, comparing across countries or even continents.

Yang and Maxwell (2011) rightfully argue that "ultimately the success of inter-organisational information sharing cannot be measured simply by successful information and knowledge transfer across different organisations or government agencies. Once information and knowledge is successfully transferred among organisations, it is also important to know whether the information and knowledge is circulated and shared effectively and efficiently" (p. 171). While this research did take this aspect into account by also asking respondents about how data circulates within their local government, perhaps the aspect could have been taken more into account.

An additional limitation relates to the framework that was derived from previous literature. In focusing exclusively on the chosen dimensions and factors, several more perspectives could have been adopted. The selected dimensions were chosen as they were deemed the most appropriate to research, yet it is acknowledged that other important factors could also have been included. Additionally, the focus on qualitative interviews, while providing in-depth insights, may not capture the full breadth of data-sharing practices. Quantitative methods, such as surveys, could be used to complement qualitative interviews to provide a more holistic view.

The study of data-sharing practices within local governments is an emerging field with significant gaps in existing research. In the context of Estonian local governments, this study deliberately adopted a broad and general approach, encompassing all types of data-sharing rather than focusing on a specific subset (e.g. within a local government, between public sector organisations, between private and public organisations). This decision was driven by the recognition that a comprehensive understanding of data-sharing dynamics is necessary to form a solid foundation for more specialised future research. However, more specific questions about data-sharing between different organisations could be addressed in future studies, leading to more specific

contributions to the research. Yet, the more general focus of this study was deemed appropriate to reach a comprehensive understanding of the topic.

By addressing these limitations and pursuing these research avenues, future studies can build on the findings of this research, contributing to a more nuanced and comprehensive understanding of how technological, organisational, and environmental factors influence the capacity of local governments to engage in data-sharing.

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Appendix 1 - Consent form

Informed consent to take part in research

Please read this informed consent document carefully. Make sure to pose all your clarifying questions about the research before participation.

Information about the research project:

Provisional title: Exploring the Capacity of Municipal Governments to Engage in Data-sharing

Researcher: Rania Alasghar (Erasmus Mundus M.Sc. in Public Sector Innovation and eGovernance, Master Student), raalas@taltech.ee

Supervisor: Dr. Ralf-Martin Soe (FinEst Centre for Smart Cities, TalTech), ralf-martin.soe@taltech.ee

Purpose: This study aims to understand the capacity of municipal governments to use data and engage in data sharing. The research goals are studied through a case study of Estonian municipal governments, using semi-structured interviews as a data collection method.

□ I have received sufficient information about the purpose of the research.

□ I am aware that I am asked to participate in a semi-structured interview that will take approximately 20-60 minutes. The interview will be held online, using video conferencing software. The interview will follow an interview guide assembled by the researcher but may include additional ad-hoc questions that arise during the interview.

□ I consent to the interview being audio recorded.

➢ I understand that my participation in this study is voluntary. I am aware that I can discontinue my participation at any time. I will not have to provide a reason for this and I will not suffer any disadvantages.

➢ The findings may be used for research purposes and may be published. My name will not be published; anonymity and confidentiality are guaranteed at every stage of the research project.

➢ I understand that under freedom of information legalisation, I am entitled to access the information I have provided at any time while it is in storage.

➢ I understand that I can contact the student researcher (see above for contact details) for any questions or to exercise my rights (access to or correction of data, ...) after participating in the study.

I have read and understand the information above and have received answers to all my questions regarding this study. I agree to participate in the study.

Date: XX.XX.2024

Name and signature of the participant Name and signature of the researcher

Rania Alasghar

(You can also sign this by inserting your saved signature or by typing your name into the signature field)