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MASTER

AI adoption of Dutch municipalities

How to enhance AI readiness and insights on high-risk AI challenges

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AI adoption of Dutch municipalities; How to enhance AI readiness and insights on high-risk AI challenges

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In fulfilment of the requirements for the degree Master of Science (MSc)

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Preface

My interest in artificial intelligence (AI) and business development has always driven me to explore ways in which these fields can intersect to create positive change. This thesis represents my desire to combine these passions and make a meaningful contribution by examining AI adoption within Dutch municipalities. I believe that by helping public organizations embrace AI responsibly, we can improve public services and ultimately make a positive impact on society.

Throughout this research journey, I received invaluable support from several individuals. I am deeply grateful to my professor and mentor, Dr. Bert Sadowski, and my second assessor, Dr. Elena Mas Tur, from the Technical University of Eindhoven, for their guidance, feedback and encouragement. Their expertise and insights greatly shaped this work. I would also like to thank Max Boiten and Guido de Moor from Dialogic. I really appreciated their practical advice and unwavering support, which were instrumental in the completion of this thesis.

Working on this project has taught me not only about ethics and equitable AI but also the importance of clear definitions and the fluid nature of research. This journey had its ups and downs, but it is this fluidity that makes research a beautiful endeavour. The process of exploring uncharted territory and gathering new knowledge is both challenging and rewarding, and it is this dynamic aspect of research that keeps me passionate about discovering new perspectives and knowledge that can be used to positively contribute to the world.

I hope this thesis not only sheds light on the challenges and opportunities of AI adoption in public organizations but also inspires others to explore the transformative potential of AI in a responsible and ethical way.

TABLE OF CONTENTS

DEFINITIONS

Adoption: In the context of technology and innovation, the adoption process refers to the process through which individuals, organisations, or communities make decisions to accept, integrate, and begin to use a new technology or innovation (Chakraborty & Edirippulige, 2021; Hall & Khan, 2002). Adoption involves not only the initial acceptance and implementation but also the ongoing utilization and integration of the technology into everyday practices and workflows (Chakraborty & Edirippulige, 2021; Hall & Khan, 2002).

AI systems: AI system means a machine-based system designed to operate with varying levels of autonomy, that may exhibit adaptiveness after deployment and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments (Artificial Intelligence Act, 2024).

Digitalization technology: Digitalization technologies are technologies that support the process of transforming the structure, processes, people skills, and culture of the entire organisation so that it can use digital technologies to create and offer products, services, and experiences that customers, employees and partners find valuable (El Sawy et al., 2020).

Municipality: A Dutch municipality is a political jurisdiction that consists of a residential area or a group of residential areas, along with the surrounding territory, all of which are governed by a local political apparatus (De nederlandse grondwet, 2023).

General purpose technology: A new method of producing and inventing that applies to many sectors and processes, important enough to have a protracted aggregate impact (Jovanovic & Rousseau, 2005).

Bias: The systematic error in the outcome of a model due to training on historical (distorted) data and other factors not allowed for in its derivation (AI hub Chapman University, 2024; Holdsworth, 2023).

Discrimination: Discrimination is defined as the unfair or prejudicial treatment of individuals or groups based on protected characteristics (such as race, gender, age, or disability) (Oxford university press, 2024).

Inscrutability: Inscrutability refers to the unintelligibility of AI systems to some audiences due to their complex inner workings and probabilistic nature (Weber et al., 2023).

Data dependency: data dependency refers to the high dependence of AI systems on the underlying data, as these systems are typically built by learning and generalising from data (Weber et al., 2023).

Decision-making: Decision-making is the process of choosing a course of action by combining predictions and judgment. Predictions involve analysing raw information or data to forecast probable outcomes, while judgment involves interpreting these predictions within the specific context of the decision (Ajay Agrawal et al., 2022).

AI readiness: AI readiness refers to the extent to which an organization or entity is prepared to effectively adopt and scale artificial intelligence technologies (Cisco, 2024).

MANAGEMENT SUMMARY

AI technologies are receiving growing attention in the media due to their vast potential and inherent risks. As a digitalization tool, AI can mimic human cognitive functions such as perception, reasoning, learning, and memory in a relatively inexpensive, rapid, and often more effective manner than humans. These capabilities are increasingly being applied across organisations, particularly in the predictive aspects of decision-making processes. Since decision-making is fundamental to organizational success, partially automating these processes with AI is considered a major advancement in the ongoing digital transformation of society.

While many organisations are eager to leverage AI's transformative potential, concerns about its risks, ranging from fears of artificial superintelligence to job displacement, persist. Governments, including municipalities, are also keen to adopt AI to enhance public services and decision-making efficiency (Alexandra C. van Huffelen et al., 2022; Mona Keijzer et al., 2019). However, more than other organisations, municipalities must carefully balance the benefits and risks of AI, as their primary purpose is to serve the public good rather than pursue financial gain. This makes it crucial for them to implement AI in a way that maximizes societal value while minimizing ethical, social, and legal risks.

While the adoption of AI in private organisations is well-studied, there is limited research on assessing AI readiness and understanding AI adoption in public organisations (Goolsbee, 2019; Mikalef et al., 2019a). This study, therefore, aims to address this gap by answering two main research questions with Dutch municipalities as the main entities of analysis:

1. How can Dutch municipalities enhance their AI adoption?

2. Why are Dutch municipalities struggling with the introduction of high-risk AI applications?

Dutch municipalities operate within a unique business environment shaped by a combination of internal and external factors. Internally, municipalities face challenges such as changing employee dynamics, resource allocation constraints, differing personal and departmental goals, and organizational culture. Externally, they are influenced by national policies, evolving regulations, public expectations, and rapid technological advancements. These factors directly impact how municipalities manage their operations, prioritize tasks, and align their strategic objectives. The interplay between internal pressures, such as resource limitations and workforce management, and external demands, like regulatory compliance and technological change, continuously require municipalities to adapt and shape how municipalities plan, make decisions, and execute their strategies.

To better understand this dynamic environment, the study employs strategic management and innovation science theories, particularly the Resource-Based View (RBV) and Dynamic Capabilities (DC) frameworks. The RBV posits that an organization’s performance is heavily influenced by its ability to identify and utilize key internal resources, such as human capital, data, and technological infrastructure. This theory provides a lens through which the operations of municipalities can be analysed, emphasizing the importance of resource management in achieving competitive advantage and operational efficiency.

Complementing the RBV, the DC framework extends this view by focusing on the need for adaptability in rapidly changing environments. In dynamic business settings, organizations must constantly combine, reconfigure, and leverage their resources to develop value-delivering capabilities. This framework is relevant for municipalities because they must frequently adjust to new regulations, public demands, and technological innovations such as AI. By applying these theories, municipalities can better identify opportunities, manage their existing resources, and develop new capabilities that enhance their AI readiness and AI adoption strategies.

The adoption of AI and AI readiness in municipalities was further analysed in depth through AI maturity models (AIMM). AIMMs are valuable tools designed to specifically assess AI readiness across multiple dimensions within organizations such as; data quality, AI governance, infrastructure, and employee skills. These models help municipalities identify their current AI capabilities, pinpoint resource gaps, and determine areas needing improvement. By using these models, municipalities can strategically plan their AI adoption journey, setting clear objectives and aligning their resources and capabilities to meet the evolving needs of their public service goals.

This study employed an iterative qualitative research method combining desk research and semi-structured interviews to explore the AI adoption challenges faced by Dutch municipalities. The iterative approach allowed for flexibility in exploring these challenges, involving multiple stakeholders, varying perspectives, and dynamic processes inherent in the municipal landscape (Hammarberg et al., 2016; Teherani et al., 2015). The selected strategic management and innovation science theories, including the Resource-Based View (RBV) and Dynamic Capabilities (DC), were deemed best suited for understanding the complex, multifaceted AI adoption issues.

Moreover, qualitative methods were particularly effective in capturing the nuanced insights of interviewees and in-depth information about underlying mechanisms, processes, and barriers to AI adoption. Early in the study, it became evident that municipalities were highly focused on strategic management issues related to regulations and risk mitigation of AI systems, particularly concerning high-risk AI applications. These applications posed significant challenges due to privacy concerns, potential discrimination, and the potential negative impact on fundamental rights. This emerging focus guided the desk research and interview questions towards these critical areas. However, at the main goal of understanding how municipalities can improve AI adoption and readiness over the long term was not lost out of sight.

Within this method of analysing how AI adoption can be improved within municipalities certain insights from interviews were analysed using a custom-developed AI Maturity Model (AIMM), specifically tailored to assess the AI readiness and adoption challenges of Dutch municipalities. This model provided a structured framework to categorise findings, evaluate AI capabilities, and identify key areas needing improvement. Unlike existing AIMMs, this model addresses the specific needs of the public sector, emphasizing responsible AI use and alignment with public service objectives. This tailored approach allows for a focused evaluation of AI readiness, identifying critical areas needing improvement in municipalities.

Key insights from the research include:

1. **Regulatory Uncertainty and High-Risk AI Challenges**:
   Regulatory uncertainty around high-risk AI applications, such as those impacting privacy and discrimination, presents a significant barrier. Navigating complex regulations like the AI Act and GDPR deters adoption, particularly for smaller municipalities that lack the resources to engage deeply in ethical and regulatory discussions.

2. **Human Resource Constraints**:
   A shortage of skilled AI professionals limits municipalities' capacity to develop and maintain AI systems, particularly in smaller municipalities. Dependence on external consultants is common but creates challenges in maintaining alignment with municipal needs and retaining AI knowledge in-house.

3. **AI Infrastructure and Resource Sharing**:
   Fragmented IT systems and reluctance to share data and infrastructure hinder AI development, especially in smaller municipalities. Initiatives like “Common Ground” aim to promote resource sharing but face challenges related to data security and compatibility, limiting the scalability of AI solutions across municipalities.

Overall, the custom AIMM provided a comprehensive framework to assess AI readiness, helping municipalities identify key strengths and gaps, guide strategic planning, and enhance AI adoption. This led to two conclusions as answers to both research questions:

RQ1: How can Dutch municipalities enhance their AI adoption?

To advance AI adoption, municipalities must thoroughly understand the business environment factors and key barriers affecting their AI readiness. By identifying these barriers, they can develop targeted strategies to enhance AI-related resources and capabilities, facilitating successful integration. This research used an AI Maturity Model (AIMM) to analyse interview data, proving to be an effective method for extracting insights to improve AI readiness. A common challenge across municipalities is the need to formulate a comprehensive AI adoption strategy, particularly around governance processes. Regulatory uncertainty and the complexities of responsible AI use were identified as the main barriers. While higher management is willing to invest in AI, the shortage of skilled personnel remains a significant constraint. Collaboration among government entities for knowledge sharing, IT infrastructure, and data exchange is seen as a crucial approach to improving AI readiness in Dutch municipalities

RQ2: Why are Dutch municipalities struggling with the introduction of high-risk AI applications?

High-risk AI applications, which often involve privacy-sensitive data, can enhance efficiency but also pose risks of unfair practices, such as exacerbating discrimination. This creates a dilemma for municipalities, which must weigh the efficiency benefits against the potential negative impacts on citizens. The fear of negative publicity from past AI applications perceived to have caused harm has led municipalities to hold back on adopting high-risk AI and instead focus on developing governance strategies for responsible AI use. While larger municipalities and the central government are working on nationwide AI governance strategies, smaller municipalities prefer to wait to avoid redundant investments. Developing these strategies is further complicated by a lack of AI governance literacy, skilled professionals, and the rapidly changing AI landscape. The AI Act has provided a robust framework for classifying AI risks, and municipalities are increasingly using standardized processes like ARA, IAMA, and DPIA to address biases and ethical concerns, ensuring thorough discussions on AI's ethical implications and reducing the risk of unintended negative outcomes.

The research highlights that while AI technologies offer significant opportunities to enhance public services, Dutch municipalities face challenges related to ethical considerations, governance, and resource constraints. To address these challenges, municipalities must actively participate in shaping fair AI policies by advocating for clearer regulatory guidelines and engaging in broader ethical discussions. Developing AI governance literacy and upskilling the workforce are essential steps for municipalities to responsibly manage high-risk AI systems and develop robust governance processes that emphasize transparency, accountability, and continuous maintenance. Tools like the Algorithm Risk Assessment (ARA) and Impact Assessment Human Rights and Algorithms (IAMA) are recommended to evaluate AI risks and ensure alignment with societal values.

Additionally, AI Maturity Model (AIMM) frameworks can be valuable tools for municipalities to continuously evaluate and enhance their AI readiness. These models provide a structured approach to assess current capabilities, identify resource gaps, and guide strategic improvements. By regularly utilizing AIMMs, municipalities can monitor their progress, adapt to evolving technological and regulatory landscapes, and ensure that their AI adoption strategies remain aligned with ethical standards and public needs. For the Ministry of Internal Affairs and VNG, the emphasis should be on establishing comprehensive governance frameworks, promoting stakeholder collaboration, and supporting centralized IT infrastructure to assist smaller municipalities in AI adoption. These measures will help municipalities and related organizations enhance AI readiness and AI adoption.

1 INTRODUCTION

In the era of rapid digital transformation, municipalities around the globe are increasingly turning to advanced digital technologies to streamline operations, improve public services, and enhance the quality of life for their residents (ICLEI, 2023). The Dutch government has also recognized that this type of technology can significantly enhance service quality and partially automate human tasks, which is why it is considering a digital transformation (Alexandra C. van Huffelen et al., 2022; Dutch ministry of internal affairs, 2021; Mona Keijzer et al., 2019). Digital technologies promise more efficient, responsive, and innovative urban governance (Brennen & Kreiss, 2016; ICLEI, 2023). Dutch municipalities are a big part of the Dutch digital transformation and are increasingly integrating various digitalization technologies (Faber, 2022).

Among the various digitalization technologies, Artificial Intelligence (AI) is currently gaining significant attention (Alexandra C. van Huffelen et al., 2022; Dutch ministry of internal affairs, 2021). AI stands out from other digitalization technologies due to its ability to perform tasks that typically require human intelligence, such as learning, reasoning, problem-solving, and interacting with the environment (Chui et al., 2018; Tarafdar et al., 2020). Although AI models and theories have existed for many years, a fresh surge of interest was sparked by the introduction of OpenAI's ChatGPT. Within just two months after its launch, OpenAI's GPT-3 model reached 100 million active users, setting the record for the fastest-growing consumer application ever (Lammertyn, 2024). This AI application was a groundbreaking advancement as an AI chatbot capable of generating impressive human-like responses. It has transformed customer service interactions, facilitated brainstorming sessions, enabled seamless translation, and much more.

New value-holding AI applications are now being developed every day, and as a digitalization technology, municipalities can greatly benefit from their adoption too (Stackpole, 2024). However, there is still a limited understanding of the level of AI readiness within public organisations to effectively do this (Goolsbee, 2019; Mikalef et al., 2019a), and more specifically, there is a lack of understanding on how to improve the AI adoption process itself. This leads to the first research question.

RQ 1: How can Dutch municipalities enhance their AI adoption?

Although AI technologies promise substantial value, they also present significant challenges (Artificial Intelligence Act, 2024; DCA, 2023). High-risk AI applications which pose significant risks to the health, safety, or fundamental rights of individuals are one of the most pressing concerns of governments (Artificial Intelligence Act, 2024). Since AI applications could also be tools that exacerbate the unfair treatment of individuals, municipalities will have to carefully choose which and how to implement AI applications into their operations (Janssen & Sadowski, 2021; Madan & Ashok, 2023).

A recent case in the public organisation landscape that highlighted this problem is the Dutch childcare scandal (Ministerie van Algemene Zaken, 2020). This case highlighted the devastating effects of AI applications being used in irresponsible ways. This AI application was profiling individuals based on unjust deemed variables and thus supported discrimination. A survey conducted in the aftermath of this scandal reported that 71% of participants felt their trust in the government was negatively impacted by this case (Valk, 2021).

Dutch municipalities are especially interesting to analyse as they execute a lot of the local and national governmental policy with the support of AI, some of which are classified as high-risk applications. Currently, 330 registered AI/algorithm applications are being utilized within municipalities (Overheid.nl, 2024). While these technologies are used to improve efficiency, reduce costs, and deliver better services to citizens there have also been cases of irresponsibly deemed use of these systems (Rekenkamer Rotterdam, 2023). To prevent the reoccurrence of irresponsible AI applications this

research aims to understand the underlying mechanisms of high-risk AI applications when used by public organisations such as Dutch municipalities. This resulted in the development of the second research question.

RQ 2: Why are Dutch municipalities struggling with the introduction of high-risk AI applications?

This research aims to contribute scientifically, firstly, by testing the usefulness and validity of AI maturity models to guide AI adoption. And secondly, by analysing the underlying mechanisms and relations of using high-risk AI applications in public organisations' context.

Using an AI maturity model within empirical research is practically useful as well. By analysing the factors and key barriers influencing the AI adoption process of Dutch municipalities, this research aims to give a comprehensive insight into the AI adoption landscape of Dutch municipalities. The insights gained from this study aim to help organisations and policymakers develop more practical strategies to enhance AI adoption.

In the following chapters, this thesis will systematically explore the multifaceted dimensions of AI adoption in the Dutch municipality landscape. Chapter **Error! Reference source not found.** presents a comprehensive literature review, discussing how AI as a digitalization technology changes decision-making processes, the current literature and regulations for high-risk AI applications, and the conceptual framework used to structure the empirical research (Figure 4). Chapter 3 continues on this further, including a description of the research design, sampling techniques, and data analysis methods used. In chapter 4 the actual empirical findings from interviews with Dutch AI experts and municipal officials are presented, stating the key insights on AI adoption barriers. Chapter 5 concludes the results by providing a comprehensive summary and answer to both research questions. Finally, Chapter 6 addresses the limitations of these findings and discusses them in the context of existing literature, providing insights for future research and practical recommendations for policymakers and practitioners.

2 LITERATURE REVIEW

2.1 HOW CAN DUTCH MUNICIPALITIES ENHANCE THEIR AI ADOPTION?

2.1.1 Business environment

Organisations exist in a complex business environment, mirroring the infinite complexity of the universe itself. Just as each individual is unique, so too is each organisation and its business environment (Brammer & Pavelin, 2008; Y. Chen et al., 2014; Duncan, 1972). This uniqueness is not static but dynamic, continuously shaped and reshaped by a vast array of interconnected internal and external factors, as depicted in Figure 1. This totality of physical and social external and internal factors interplaying with individuals' decision-making behaviour is defined as the business environment (Duncan, 1972).

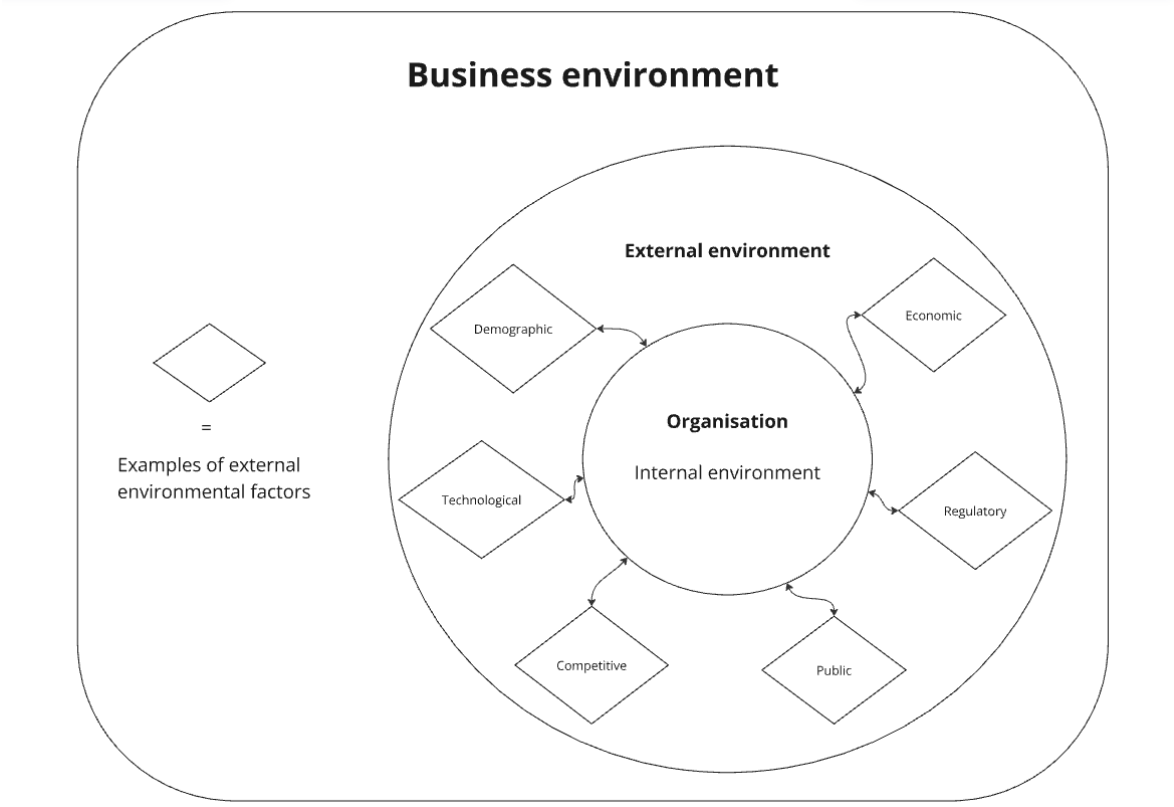


Figure 1 conceptual model of the business environment with example factors

For example, one could view the demographic location of an organisation as an external factor. A tech startup in Silicon Valley operates at a location that is characterised by its rich technological resources, knowledge, concentration of similar businesses, and culture of innovation and risk-taking (Fung et al., 2016). On the other hand, an organisation in Kenya could operate in an environment that is known for its richness in community engagement but also its challenges in limited access to technological resources or infrastructure (Mugendi, 2020; Power Africa, 2022).

Municipalities typically have various local responsibilities and tasks that directly affect the daily lives of their residents, such as urban planning, culture enhancement, and public safety (De nederlandse grondwet, 2023). In addition to their local responsibilities, municipalities act as executors of national policies at the local level, operating under the laws set by the central government. This involves implementing national regulations and programs related to spatial planning, employment and income support, youth care, and healthcare for the elderly and long-term ill (Koninkrijksrelaties, 2012).

Municipalities are a prime example of public organisation as public organisations are defined as entities that serve the public interest (Lenart-Gansiniec, 2021; William, 2022). i.e. Their purpose is to best deliver public services based on their citizen's wants and needs. This is a highly dynamic and subjective definition since societies and their priorities continuously change over time due to evolving public expectations, technological advancements, and shifts in cultural, political, and economic landscapes (Lowe et al., 2020; Shittu, 2020).

Understanding the business environments of organisations and their respective characteristics could be highly valuable for organisations as it enables them to identify strategic opportunities, adapt to market changes, enhance their competitive advantage, and adopt innovations effectively (Hamel & Prahalad, 1994; Miles et al., 1978). Understanding business environments and the factors influencing them guides better decision-making and strategic management of organisations (Aldrich & Pfeffer, 1976; Barney, 1991; Oliveira & Martins, 2011; Porter, 1985; Suri, 2011).

2.1.2 Literature and frameworks for strategic management of AI adoption

AI can be seen as an external business environment factor that is increasingly influencing multiple organisations' business environments. As a novel general-purpose digitalization technology, AI has the potential for a protracted aggregate impact on society and the economy through various sectors and structures (A more elaborate explanation of AI as a general-purpose digitalization technology is presented in chapter 2.2) (Chui et al., 2018; Dr. Anand S. Rao, 2017; Tarafdar et al., 2020). Many organisations and individuals see the potential of AI and are now in the AI adoption process, making decisions to accept, integrate, and begin to use this new technology. Their goal is to make decisions to best balance the potential value and challenges of AI (Dr. Anand S. Rao, 2017; Edge Delta, 2024; Narayanan, 2023).

This chapter provides the strategic management theories and frameworks through which the AI adoption process of municipalities was analysed, enabling the formation of a grounded answer to RQ 1 on how AI adoption within municipalities can be improved (Nadkarni & Prügl, 2021; Omol, 2023). The specifically chosen theories and frameworks that aim to support the generation of a comprehensive understanding of AI adoption are; Resource Based View (RBV), Dynamic capabilities (DC), and AI maturity models (AIMM). The RBV framework is a general theory explaining that organisations can identify and leverage key internal resources to drive competitive advantage and operational efficiency. The DC framework is an extension of the RBV theory and emphasizes the need for adaptability in rapidly changing environments. It focuses on how organisations can use their resources to create capabilities and capture value. Lastly, the AIMM offers a specific framework for evaluating the current state of AI capabilities and practices within organisations to advance AI integration. These frameworks will be explored in greater depth in the following chapters.

2.1.2.1 RBV and DC as a perspective on organisations

The Resource-Based View (RBV) remains one of the dominant frameworks in strategic management (Lavie, 2008; Lockett et al., 2009; Madhani, 2009; Wernerfelt, 1984). RBV was first introduced by (Wernerfelt, 1984), Wernerfelt viewed the organisation as a historically determined collection of assets or resources that are tied 'semi-permanently' to the organisation. The RBV is flexible and inclusive, which means it covers a lot of ground about what companies are and how they operate. This flexibility has contributed to its popularity, as it does not rely on rigid assumptions about corporate behaviour (Lockett et al., 2009).

The RBV traditionally provides static assessments of a firm's resource assortment. Resources encompass the assets a firm possesses, which can be categorized as tangible, such as machinery, buildings, and financial capital, or intangible, including skills, intellectual property, brand reputation, and company culture (Lockett et al., 2009).

However, due to the limited applicability of traditional RBV frameworks in dynamic environments that evolve over time and at an exponential rate, the DC theory emerged as an extension (Bleady et al., 2018; Kero & Bogale, 2023). This theory emphasizes a crucial distinction between resources and capabilities where capabilities, refer to the firm's ability to bundle, manage, or exploit resources in ways that create value and sustain competitive advantage (Edwards, 2014; Teece, 2014; Winter, 2003; Zhou et al., 2019).

An illustrative example of the necessity for DC is the adoption of new technologies such as AI. In an era where technological advancements occur at an unprecedented pace, firms must not only acquire AI technologies (a resource) but also develop the capability to integrate and utilize these technologies effectively within their operations.

For instance, consider a retail company that adopts AI-driven analytics to enhance its supply chain management. The initial acquisition of AI software is merely a tangible resource. However, transforming this resource into a valuable capability requires the firm to develop the skills to interpret AI-generated insights, integrate these insights into decision-making processes, and continuously adapt the AI systems in response to changing market demands and technological advancements. This process exemplifies dynamic capabilities at work; sensing new opportunities presented by AI, seizing these opportunities by reconfiguring existing resources, and transforming the organisation to leverage AI for competitive advantage.

Over the years RBV with its DC extension gained a dominant position in the field of strategic management research. Generally relating to the relationship between an opportunity set facing the firm, the resources and capabilities present in the firm, the strategic behaviour to be implemented by managers, and the outcome in terms of competitive advantage or performance (Lockett et al., 2009).

To better understand how these outcomes are achieved, it's important to delve into the characteristics that make resources and capabilities advantageous. Barney (1991) provides a useful framework for this analysis, defining four key criteria for resources and capabilities that can support a durable competitive advantage: they must be valuable, rare, imperfectly imitable, and non-substitutable (VRIN).

Valuable resources enable a firm to capitalize on opportunities and mitigate threats within its environment. Rare resources are those that are scarce and not widely available to current and potential competitors. Inimitability describes the difficulty other firms face in replicating these resources. Non-substitutability means that a resource cannot be easily replaced by another. Valuable resources are termed strategic assets (Amit & Schoemaker, 1993; Barney, 1991) and the RBV asserts that ownership and control of valuable assets determine which organisations will earn superior profits and enjoy a position of competitive advantage over others (Madhani, 2009).

A significant portion of RBV research is centred on competitive advantage in dynamic environments, however, municipalities' business environment is often characterized by low levels of competition (Borins, 2001; Hughes, 1998; Ugyel, 2016). The work of Szymaniec-Mlicka, (2014) is particularly noteworthy in this regard as the article presents a comprehensive review of existing research on the application of the Resource-Based View (RBV) in the management of public organisations. Adding to the valuable review provided by Szymaniec-Mlicka, this research aims to add to RBV literature by using a RBV within an atypical context, aiming to understand how the RBV applies in contexts where competition is low. In this context, the necessity for resources that are imperfectly imitable and non-substitutable is arguably reduced (D. Miller, 2019; Priem & Butler, 2001).

2.1.2.2 Research in identifying AI adoption requirements and barriers

While RBV and DC are lenses to look at organisations there is also research that is aimed at studying the requirements and barriers of technology adoption. Within the field of strategic management, research has been done to categorize organisational characteristics and analyse their relation with an organisation's adoption capabilities and general performance (Allen et al., 2017; Arad et al., 1997; de

Waal, 2007; Kontoghiorghes et al., 2005). This type of research helps organisations to navigate their environments more effectively by enabling the (proactive) development and alignment of resources and capabilities with environmental demands, driving sustained growth and success (Hamel & Prahalad, 1994; Scott, 2001).

To adopt AI applications effectively municipalities will benefit from specific resources and capabilities. While AI technologies continue to evolve rapidly the science of AI adoption requirements and barriers is still emerging and limited (Agarwal et al., 2022). Some early attempts by for instance, Weber et al., (2023), identified multiple resources and capabilities that affect AI adoption. These findings stemmed from the analysis of the AI characteristics; Inscrutability and data dependency. Weber et al., (2023) found that AI project planning and co-development can help to cope with the high uncertainty in the early stage of AI projects and the intensified information gap between stakeholders, while data management and AI model lifecycle management help to cope with the challenges in providing a proper data foundation and the required continuous adjustment of AI systems as the data evolves (Weber et al., 2023).

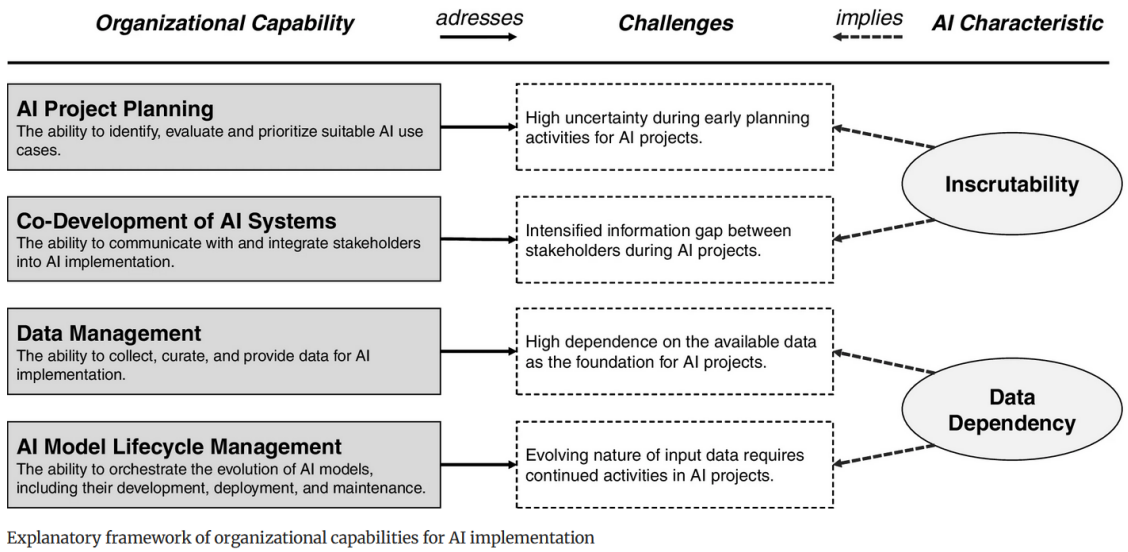


Figure 2 adoption requirements research of (Weber et al., 2023)

Other researchers used different approaches such as the TOE adoption framework to define AI adoption requirements (Agrawal, 2023; Neumann et al., 2024). Agrawal, (2023) identified several barriers and requirements across the technological, organisational, and environmental factors that influence the adoption of AI, particularly generative AI, in organisations.

- **Technologically**, the relative immaturity of generative AI and the lack of standardized protocols pose significant challenges. Organisations often struggle to align generative AI with their existing information infrastructure due to compatibility issues. However, those with prior experience in related information systems and compatible infrastructure find it easier to integrate generative AI, leading to a smoother transition and more successful adoption (Agrawal, 2023).
- On the **organisational** side, firm size plays a critical role in AI adoption. Larger organisations are more likely to adopt generative AI because they have more extensive resources and can better manage the associated costs, such as those for software, hardware, and consultancy services (Agrawal, 2023).
- Interestingly, on the **environmental** side of AI adoption regulatory support has been found to hinder AI adoption (Agrawal, 2023). The complexities introduced by regulatory requirements from the external environment can create obstacles for organisations. In contrast, environmental

factors such as uncertainty and competition intensity act as catalysts, driving organisations to adopt AI to maintain a competitive edge (Agrawal, 2023).

In conclusion, AI adoption research, even though still quite fragmented and scarce, has made strides in identifying relevant AI requirements and complementary resources for initiating AI projects (Agrawal, 2023; Fountaine et al., 2019; Weber et al., 2023).

Within AI adoption research, experts will continue to discuss AI adoption requirements and complementary resources that organisations must take into account if they want to realize performance gains from AI investments. Mikalef drawing on the DC framework correctly notes that it is crucial that organisations perceive AI complementary resources as necessary but should also understand that these resources by themselves are not sufficient for creating new capabilities and ultimately achieving performance gains (Mikalef et al., 2019). Organisations should, therefore, focus not only on acquiring AI-supporting resources but also on developing firm-wide AI capabilities to prevent costly investments that fail to yield competitive or financial returns (Mikalef et al., 2019b). He among many others are introduced multiple AI maturity frameworks (AIMM) that aim to analyse the AI-specific resources and capabilities present in organisations to guide the strategic management of AI adoption (Agrawal, 2023; Alsheiabni et al., 2019; Cisco, 2024; Mikalef et al., 2019b; Papagiannidis et al., 2021; Weber et al., 2023).

2.1.2.3 AI maturity models

AI maturity models are seen as novel and valuable tools used to define an organisation's readiness to leverage AI effectively in their operations, but in the field of AIMM research they are also seen as broad and open for interpretation (Alsheiabni et al., 2019; Saari et al., 2019). There is an ongoing debate about, appropriate theoretical frameworks for analysis, and the overall validity of these developed frameworks and models, as they are often not grounded in theory (Alsheiabni et al., 2019; Saari et al., 2019). However, an AIMM can still support strategic management by analysing AI resources and capabilities within the organisation and benchmarking them against internal AI adoption goals, competitors, or an industry (Alsheibani et al., 2019; Saari et al., 2019). Typically, these models consist of two key components: maturity levels and AI-supporting areas/dimensions.

The first key component, AI maturity levels, provides a broad description of how extensively AI is integrated within an organisation. These levels can serve as subjective benchmarks for organisations to determine their current state and to develop strategies for further AI adoption based on their specific business needs and goals. It's important to note that not every organisation needs to reach the highest level of AI maturity, as the optimal level of AI integration depends on the organisation's unique AI strategy and objectives (Cisco, 2024).

Different frameworks define these levels differently, but they generally follow a similar progression from initial experimentation to full integration and optimization (Alsheiabni et al., 2019; Cisco, 2024; Sadiq et al., 2021). The framework developed by Alsheiabni et al., (2019) differentiated the degree of AI adoption or maturity within an organisation across 5 levels and defined typical characteristics related to the AI maturity levels of organisations (see appendix 8.1). Other frameworks such as (AI Singapore, 2024; Cisco, 2024; Neumann et al., 2024) may use a different amount of levels and define maturity level characteristics differently.

Table 1 AI maturity levels as defined by (AI Singapore, 2024)

	AI Unaware	AI Aware	AI Ready	AI Competent
Average Score	**Less than 2.5**	**2.5 to 3.4**	**3.5 to 4.5**	**Greater than 4.5**
Interpretation	Organisation might hear about AI, but is unaware of AI applications.	Organisation is aware of AI applications and could identify potential use cases.	Organisation has the capabilities to integrate pre-trained AI models into products or business processes.	Organisation has the capabilities to develop customised AI models and solutions for specific business needs.

Common practice is to assess multiple AI-supporting dimensions via a survey and score them based on the presence of respective AI adoption resources and capabilities (AI Singapore, 2024; Cisco, 2024; Sadiq et al., 2021). In these frameworks, organisations can exhibit different levels of AI readiness within these dimensions. The lowest scoring area is considered the determining factor for the overall AI maturity level, referred to as the weakest link in the chain (AI Singapore, 2024). The developers of these frameworks recommend organisations to improve the lowest-scoring dimensions first (AI Singapore, 2024). Within different AIMM, dimensions may differ, specified for industries and types of organisations (Butler et al., 2021; Papagiannidis et al., 2021; Sadiq et al., 2021).

Table 2 AI maturity framework from the literature (AI Singapore, 2024)

Pillars	Dimensions	Assessments
Organisational Readiness	Management Support	Whether the organisation has allocated resources for AI initiatives
	AI Literacy	Whether the employees could identify potential AI use cases and be savvy consumers of AI solutions
	AI Talent	Whether the organisation has the capabilities to develop, integrate, and maintain AI models
	Employee Acceptance of AI	Whether the employees trust and accept AI-bases systems
	Experimentation Culture	Whether the organisation has an experimentation culture for employees to explore and develop AI use cases
Ethics and Governance Readiness	AI Governance	Whether the organisation has appropriate governance to avoid unintentionally harming end-users
	AI Risk Control	Whether the organisation has a proper classification of the risk level of AI systems
Business Value Readiness	Business Use Case	Whether the organisation has identified suitable AI use cases and assessed their value propositions
Data Readiness	Data Quality	Whether the organisation has processes to ensure the quality (accuracy, completeness) of data collected
	Reference Data	Whether there is a single source of truth, consistency of data format, and reliable metadata
Infrastructure Readiness	Machine Learning (ML) Infrastructure	Whether the organisation has appropriate and sufficient ML infrastructure (e.g., GPU, memory) to support AI model training and deployment
	Data Infrastructure	Whether the organisation is using appropriate data infrastructure (e.g., data lake) as a central repository of data

Soley scoring, however, doesn't give enough insights for managers to understand the underlying factors and mechanisms affecting AI adoption and what resources and capabilities are missing. Assuming that the surveyed person is capable of filling in this survey adequately these frameworks at best can direct managers to the business area within an organisation that needs to be developed first. This study aims to gain a deeper understanding of what specific capabilities or resources are lacking and therefore uses, qualitative research instead of surveys. These insights can then be used in strategic management

activities focused on altering organisational design and acquiring and developing resources and capabilities to improve an organisation's AI adoption.

2.2 Why are Dutch municipalities struggling with the introduction of high-risk AI applications?

To understand why Dutch municipalities are struggling with the introduction of AI applications it is essential to grasp AI's role within the broader context of what its capabilities and risks are. AI can be characterized as a digitalization technology (Chatterjee et al., 2022; Narayanan, 2023). AI, as a digitalization technology leverages algorithms to analyse computer-readable data and mimic human cognitive functions such as perception and reasoning. Mathematically mimicking these cognitive functions can facilitate tasks such as predictive modelling, pattern recognition, natural language processing, and ultimately decision-making (Diagnositc image analysis group, 2024; HiTechNectar, 2024). Decision-making is the cornerstone of every organisation, serving as the vital mechanism through which choices are evaluated and selected, and consists of an information processing (prediction) and judgment step (Ajay Agrawal et al., 2022). As AI can surpass human accuracy and lower information processing costs it has the potential to revolutionise many sectors ranging from healthcare and finance to public administration and urban governance (Chatterjee et al., 2022; Chui et al., 2018; Daylen, 2022; Diagnositc image analysis group, 2024; google deepmind, 2024).

2.2.1 AI within the decision-making process

2.2.1.1 AI improving information processing (prediction)

To illustrate the information processing concept of AI further, let’s consider a practical example. In medical diagnostics, CT scans are renowned for their ability to provide detailed images of internal structures, opening up the possibility of detecting cancerous tumours. Image recognition AI is increasingly used because it has better accuracy and consistency of cancer detection than most healthcare professionals (Diagnositc image analysis group, 2024; Hossain et al., 2024). By leveraging vast datasets and machine learning capabilities, AI models can detect subtle patterns and anomalies that may escape human observation, thereby improving diagnostic accuracy and reducing the overall burden of diagnostic errors in cancer detection see Table 3 & Table 4 (Diagnositc image analysis group, 2024; Hossain et al., 2024).

Table 3 hypothetical prediction error table of cancer prediction by a human expert

	Actual Condition: No Cancer	Actual Condition: Cancer
Prediction Outcome: Negative (No Cancer)	90% (True Negative)	15% (False Negative)
Prediction Outcome: Positive (Cancer)	10% (False Positive)	85% (True Positive)

Table 4 hypothetical prediction error table of cancer prediction by image recognition application

	Actual Condition: No Cancer	Actual Condition: Cancer
Prediction Outcome: Negative (No Cancer)	95% (True Negative)	8% (False Negative)
Prediction Outcome: Positive (Cancer)	5% (False Positive)	92% (True Positive)

However, even with CT scans' improved predictive powers, diagnostic errors are still occurring and can have serious consequences for hospitals and patients (Amitabh et al., 2005; Kim & Mansfield, 2014). There are two types of errors that can occur, type 1 errors, or false positives, occur when the AI

incorrectly identifies a non-cancerous condition as cancerous. This misinterpretation can lead to unnecessary biopsies, invasive procedures, and treatments, imposing financial burdens on healthcare systems and causing undue stress to patients (White & Algeri, 2023). Moreover, the emotional toll of a false cancer diagnosis on patients and their families is profound, affecting their quality of life and mental well-being (Singh et al., 2007; White & Algeri, 2023).

Secondly, type 2 errors, or false negatives, occur when a cancerous tumour is present but is missed or incorrectly identified on a CT scan. This wrong diagnosis can result in missed opportunities for early intervention or faulty treatment, potentially allowing the cancer to progress to a more advanced stage or worse (Singh et al., 2007). Financially these errors are also unwanted since late-stage cancer treatments are typically more expensive and less effective, further escalating healthcare costs (Neal, 2009).

Because real-world scenarios are complex and involve inherent biases and data restrictions, AI can never be flawless at predicting outcomes. For example, biases in training data might lead to skewed predictions by AI systems, resulting in systematic errors that disproportionately impact particular groups (Ferrer et al., 2021; Holdsworth, 2023). Further reducing prediction accuracy is the fact that a lot of the data used to train AI models is noisy, partial, or not entirely representative of the population (Schwartz et al., 2022; Smith & Rustagi, 2021).

In addition, errors are unavoidable because of the changing nature of the contexts in which AI applications operate. Despite ongoing advancements in machine learning methodologies and the growing accessibility of high-quality data, the complexity and unpredictability of real-world scenarios guarantee that a certain amount of errors persists. These information-processing errors, whether false positives or false negatives, highlight the critical need for human oversight and judgement, particularly in high-stakes fields like healthcare.

2.2.1.2 Judgement

Information processing or prediction is merely the initial step in the decision-making process. Decisions are founded on predictions, followed by judgments on these predictions (Ajay Agrawal et al., 2022). These elements complement each other, where (AI) predictions use the raw information or data and predict probable outcomes, and judgment uses the context in which the decision has to take place so that a value-based interpretation and the course of action can be defined. Judgment encompasses the interpretation of the results of the analysis, the consideration of implications, the evaluation of the pros and cons of various options, and ultimately, the making of a decision. For this part, a multitude of other factors come into play, adding layers of complexity to the decision-making process.

As example, we take the CT scan again. While AI can analyse the CT scan and predict the likelihood of a potential tumour, the final decision on the course of treatment involves judgment. This judgment must take into account not only the AI's prediction but also a variety of other factors such as the patient's financial situation, age, religious beliefs, and presence of other diseases. A young, healthy individual might opt for a more aggressive treatment, while an older patient with multiple health issues might prefer a less invasive approach. Similarly, a patient's financial situation or religious beliefs might influence their willingness to undergo certain treatments.

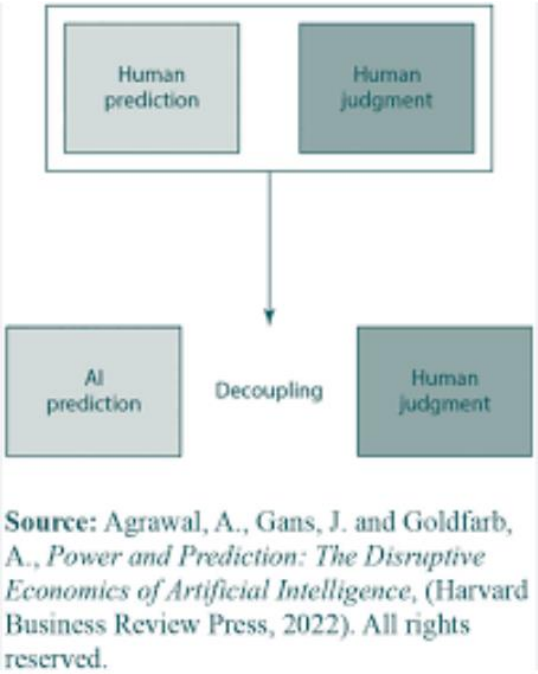
In essence, judgment ensures that decisions are not solely data-driven but also align with human norms and values. It integrates the cold precision of data with the warmth of human values, creating a balanced decision-making process that serves the best interests of all stakeholders.

2.2.1.3 Decoupling of prediction and judgement

The introduction of AI has brought about significant changes in traditional decision-making systems. In traditional decision-making systems, such as medical diagnostics, there was no image recognition software for CT scans. The same individual was responsible for both prediction and judgment. The

medical expert would interpret the scan (prediction) and then decide on the best course of action based on the patient's context (judgment).

With the introduction of AI and the increase in outsourcing of information processing (prediction) tasks, these two components of decision-making become more decoupled (Figure 3). This transformation of the decision-making system introduces new opportunities and challenges for organisations.



Source: Agrawal, A., Gans, J. and Goldfarb, A., *Power and Prediction: The Disruptive Economics of Artificial Intelligence*, (Harvard Business Review Press, 2022). All rights reserved.

Figure 3 Decoupling of the decision-making process

2.2.1.3.1 Decoupling opportunities

Depending on the context in which the decision-making process takes place there are multiple opportunities for organisations to gain value from the decoupling of prediction and judgement. One of the greatest benefits of outsourcing prediction in decision-making is that it frees up valuable time. This time can be used to focus on more human-centred, important, and/or fulfilling tasks such as the judgment aspect of decision-making or other tasks improving the performance of the organisation. Next to time savings, decoupling also can present opportunities for redistributing the judgment interpretation so that it can be done by a group of people or the best judger of an organisation. A better division of judgement responsibilities and the opportunity to consider more narratives can create nuance potentially leading to more balanced and well-rounded decisions (Ajay Agrawal et al., 2022).

A third opportunity is the possibility to fully automate and scale decision processes. To be able to do this judgment needs to be codified. This is, however, not always feasible or appropriate. For instance, in the case of CT scans, each patient's situation is unique, and automated judgement is not appropriate because of the big impact on personal lives. On the other hand, in fields like supply chain management where judgment factors and the impact of a decision are less personal, automation can be beneficial. An AI can predict the demand for a product based on historical sales data and current market trends, and this prediction can then be used in pre-codified judgement schemes to automatically decide on the optimal inventory levels, reducing the risk of overstocking or understocking (Raviv & Kolka, 2013).

2.2.1.3.2 Decoupling challenges

The decoupling of decision-making also presents its own set of challenges. In traditional decision-making systems (i.e. where prediction and judgment are not decoupled) the responsibility for decision outcomes could be attributed to individuals or a small group within an organisation. If these errors

occurred and were criticized by the public, it was often easy to attribute these errors to a single individual or small group within the organisation. Organisations could somewhat distance themselves from these errors by stating that others in the organisation would have made better predictions, or by simply attributing these errors to the inevitable mistakes of humans.

However, the introduction of AI prediction models has significantly transformed this responsibility landscape. Errors are no longer linked to an individual but rather the result of an organisation-wide model. The responsibility for the outcome of the prediction and decision therefore becomes diffused across multiple stakeholders, resulting in responsibility diffusion problems (Darley & Latane, 1968).

For example, when municipalities implement AI-driven algorithms to determine police patrol routes, the responsibility for errors becomes spread across various departments such as the teams responsible for acquiring and curating the training data, the IT department that manages the software, the police department that follows the recommendations, and the municipal leadership that approves the system. This fragmentation can lead to a situation where no single entity feels fully accountable for the consequences of the AI's decisions, creating diffusion of responsibility issues.

2.2.2 Privacy and ethical concerns in AI applications

While the diffusion of responsibility issue can be prevented by making one entity accountable there are also other fundamental concerns with AI applications. AI technologies present significant risks, particularly regarding privacy and fairness. The ability of AI to combine and analyse data from various sources can (un)intentionally expose individuals' private details without their knowledge or consent. potentially leading to unauthorized surveillance, data breaches, and misuse of sensitive information (DigitalOcean, 2023; K. Miller, 2024).

For instance, AI's profiling capabilities, where it uses personal data to derive sensitive information, such as health conditions, financial status, or political beliefs can be used to manipulate actions, and further increase social inequalities (DigitalOcean, 2023; K. Miller, 2024). Such uses may be considered unwanted according to European standards, as they can potentially undermine personal autonomy and increase the unfair treatment of individuals. Without adequate safeguards, the deployment of AI technologies carries significant risks, highlighting the urgent need for robust regulatory frameworks.

The GDPR, implemented in 2016, is an important regulation of data protection and privacy within the European Union. It establishes strict guidelines on how personal data can be collected, processed, and stored, emphasizing the principles of data minimization, purpose limitation, and the need for explicit consent (General Data Protection Regulation, 2018). For AI systems that rely on vast amounts of data, the GDPR plays a critical role in ensuring that these systems do not misuse personal information.

More specific regulation for AI is the AI Act, which represents one of the first big efforts to regulate AI comprehensively (Artificial Intelligence Act, 2024). The regulation aims to enhance the European market by establishing a consistent legal framework for the development, use, and deployment of AI systems within the European Union (Artificial Intelligence Act, 2024). It seeks to promote human-centric and trustworthy AI while ensuring the protection of health, safety, fundamental rights, and environmental standards (Artificial Intelligence Act, 2024). The AI Act categorizes AI systems based on their risk levels and has a particular focus on regulating "high-risk" AI systems (Artificial Intelligence Act, 2024).

Together, the GDPR and AI Act create a regulatory environment that seeks to balance the innovative potential of AI with the need to protect individuals and society from its potential harms. As municipalities adopt AI technologies, these regulations provide essential guidelines for navigating the complex ethical landscape associated with AI. However, even though these regulations can be used as robust guidelines for responsible AI development and use, they cannot guarantee public approval of AI use (Rekenkamer Rotterdam, 2023; Valk, 2021). Organisations that try their best to take into account

these regulations and develop AI responsibly by general European standards can encounter critique from people with different world views. The use of organisation-wide AI models reinforces the discussion on what unequal treatment is just and unjust.

2.2.2.1 Example of irresponsible AI use harming citizens

An example case that shows the complexity of using high-risk AI applications is the Dutch childcare scandal (Parlementaire ondervragingscommissie, 2020). In this case, the Dutch Tax and Customs Administration used privacy-sensitive data for the prediction of a likelihood score that citizens were exercising fraudulent activities with childcare support (Ministerie van Algemene Zaken, 2020).

Since every AI application makes errors this model also scored some citizens wrong. The most impactful for individual citizens were type 1 errors (high score on fraud likelihood while not exercising fraud) as they would be checked excessively. In this case an estimated 8,000 parents were wrongly accused of making fraudulent allowance claims (Wijnen, 2020).

This on itself is not against European standards or regulatory frameworks such as the GDPR and AI act. However, the data used in the AI model to predict the fraud likelihood score was privacy-sensitive. This model used the number of passports an individual holds as a variable. Predicting a higher likelihood of fraud based on the number of passports is unjust and goes against the GDPR, as it is hard to justify this as a causal relationship with actual fraudulent behaviour (Parlementaire ondervragingscommissie, 2020). This approach disproportionately affected racialized groups and media outlets subsequently described the working procedure of the Tax and Customs Administration as “discriminatory” against parents with foreign backgrounds (Rutten, 2022).

What made this case extra problematic was the judgement part of the decision-making process. The Tax and Customs Administration demanded the wrongly accused people to pay back their allowances without checking if high fraud likelihood predictions were wrong (Wijnen, 2020). In many cases, the claims amounted to tens of thousands of euros, driving wrongly accused families into severe financial hardship, while they needed support (Wijnen, 2020).

Criticizing the lack of a process to verify whether a prediction is faulty is valid, but even if the Tax and Customs Administration had chosen to double-check type 1 errors, individuals might still feel discriminated against. This is because citizens with multiple passports are more likely to be flagged as having a high probability of committing fraud, leading to an excessive number of controls compared to those with only one passport. Evidence of this issue is also emerging in the context of fraud-detection AI in banks, where a segment of customers are checked more severely than as the result of a profiling AI (NOS, 2024).

2.2.3 Conclusion

AI, as a digitalization technology, holds significant potential to revolutionize decision-making by enhancing information processing by improving accuracy and cost efficiency (Chatterjee et al., 2022; Chui et al., 2018; Daylen, 2022; Diagnositc image analysis group, 2024; google deepmind, 2024). However, errors are inherent in any decision-making process (Singh et al., 2007). While these errors may be tolerable in low-risk AI applications, they become critical in high-risk scenarios where the potential impact on safety, fundamental rights, and public interests is substantial (Ferrer et al., 2021; NOS, 2024; Rekenkamer Rotterdam, 2023; Valk, 2021).

Dutch municipalities struggle with the implementation of AI primarily because many of their tasks inherently involve systematic unequal treatment, such as supporting low-income citizens while taxing the wealthy. As a society, we determine what forms of unequal treatment are justified and acceptable. However, when AI supports these tasks by processing privacy-sensitive data, it can create perceptions of unfair treatment, resulting in unwanted feelings of discrimination (Ferrer et al., 2021; NOS, 2024; Rekenkamer Rotterdam, 2023; Valk, 2021; Wijnen, 2020).

2.3 CONCEPTUAL FRAMEWORK WITH ANALYSED RELATIONS OF FACTORS

In this final section of the literature review, an in-depth explanation of the conceptual framework that serves as the study's foundation is explained. This conceptual framework offers an organised overview of the empirically analysed business environment of Dutch municipalities' with its respective factors and their relations influencing AI adoption performance. By analysing these relations and factors via sub-questions the research aims to create comprehensive insights into how these factors affect AI adoption outcomes, ultimately guiding strategic management in improving AI adoption.

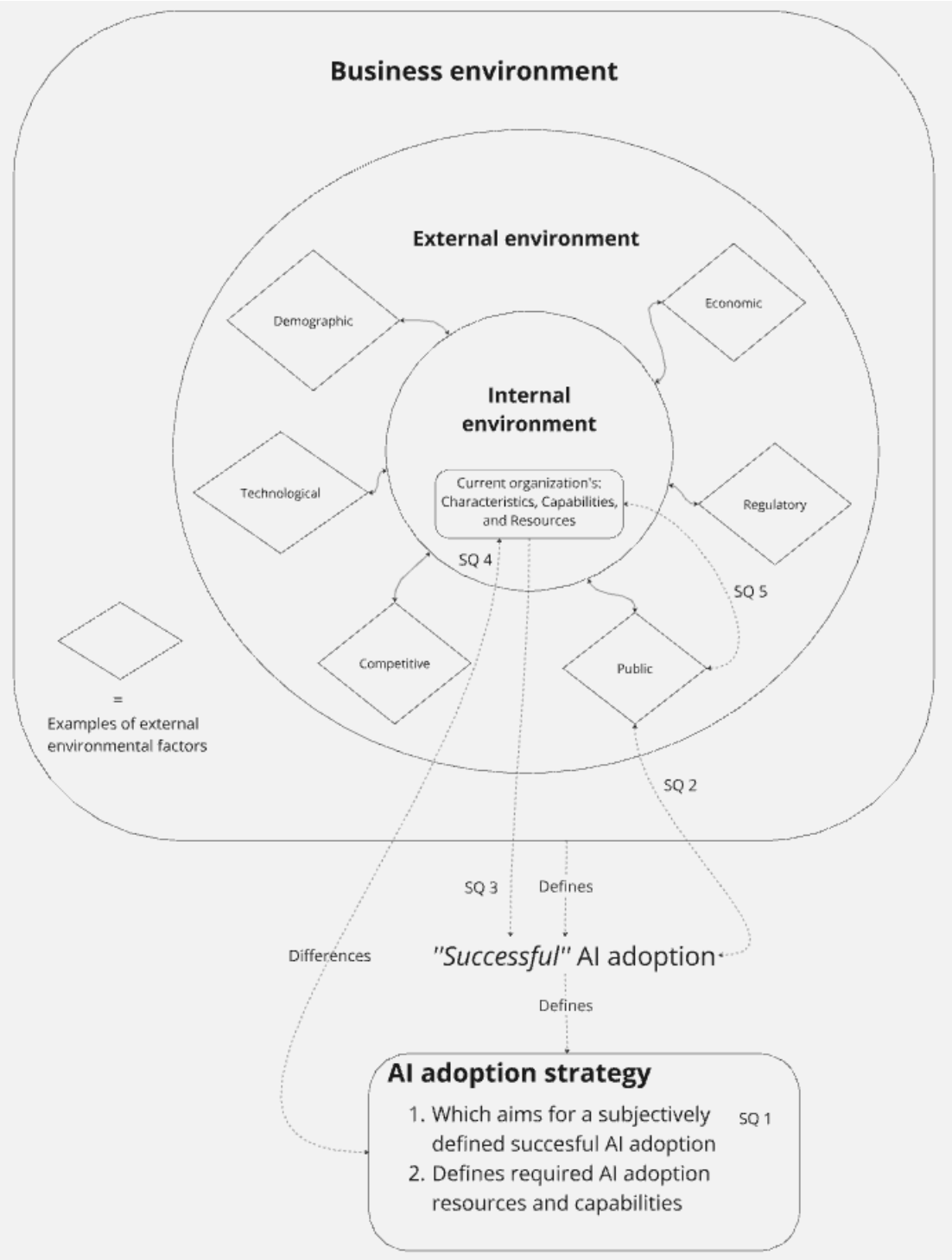


Figure 4 conceptual framework of research

To summarize business environment literature, multiple researchers supported the idea that organisations operate in a business environment that shapes their behaviours (Aldrich & Pfeffer, 1976; Banwo et al., 2022; Borins, 2001), and dictate the ideal organisational design and strategies (Ashri, 2020; McKelvey & Aldrich, 1983). Reasoning further from this idea indicates that the definition of ‘’successful’’ AI adoption for municipalities’ can vary significantly. Consequently, each municipality must craft an AI strategy that aligns with its specific business environment and AI adoption goals. A perfect strategy for one municipality can be an entirely unsuitable strategy for another (Ashri, 2020). By analysing the AI strategies of municipalities, this study tries to detect if a subjective interpretation of 'success' underpins and guides municipalities’ AI adoption strategies. **SQ 1: Will municipalities’ AI strategies aim for a defined subjective adoption ‘’success’’?**

To improve AI adoption in municipalities it is important to analyse what specific business environment factors significantly influence the subjective interpretation of successful AI adoption. Drawing from the example cases and theory on high-risk AI applications, a prominent factor seems to be public perception. the second relation that was tested in this research was the negative public perception stemming from past discrimination exacerbating AI applications. **SQ 2: Is the negative public perception stemming from past AI cases significantly influencing the subjective interpretation of successful AI adoption and therefore municipalities' AI strategies?**

While external factors such as public perception are influential, internal organisational factors are also expected to play a key role in shaping the subjective interpretation of successful AI adoption. According to the Resource-Based View (RBV), organisations possess heterogeneous resources, leading them to adopt different strategies based on their unique resource mixes (Lavie, 2008). This heterogeneity suggests that a municipality's perceived level of resources and capabilities could influence how ambitious it can be in its AI adoption efforts, thereby determining the targeted level of AI maturity within the AI maturity model (Cisco, 2024). This insight from literature forms the basis of the third analysed relation: **SQ 3: Is the subjective interpretation of ‘successful’ AI adoption influenced by the perceived current level of resources and capabilities?**

Municipalities should not only consider their current resources, and capabilities for setting their AI adoption goals but also use this assessment as a starting point to identify what needs to be improved to achieve their desired level of AI maturity. Whenever a municipality aims for a higher maturity level than it currently possesses, there will inevitably be a gap between its present state of resources and capabilities, and its future aspirations for these. Identifying this gap and its missing resources supports the creation of roadmaps for strategic planning, highlighting areas where investments in technology, training, and resources are necessary (Chutivongse & Gerdsri, 2019; Kappel, 2001).

Two in the literature stated requirements for AI adoption are assessed for municipalities via sub-questions 4 and 5. These two specific requirements (experimentation and flexibility) were assessed because the business environment of municipalities is typically defined with resources and capabilities that contradict these requirements (Allen et al., 2017; Alsheibani et al., 2019; Borins, 2001; Madan & Ashok, 2023; Mikalef et al., 2019a).

The environment of municipalities is shaped by a diverse array of stakeholders, including government bodies, community groups, and individual citizens, each with their concerns and expectations. In this business environment, priorities such as citizen safety, trustworthiness, and stability are often considered more important than financial rewards and competitive advantage, constituting a different view on innovation (Borins, 2001). Research indicates that, in the business environment of public organisations, unsuccessful innovations are punished more severely than successful ones are rewarded as compared to private organisations (Borins, 2001). This perception hinders the adoption of innovations (Borins, 2001). While uncertainty and the drive for competitive advantage have already been linked as catalysts for AI adoption in private organisations (Agrawal, 2023), the literature on municipalities indicates that the complex web of accountability and its relation to public trust often

results in a risk-averse culture as decisions related to AI adoption are scrutinized heavily for their potential societal impact (Bate, 2022; Novelli et al., 2024). This risk-averse culture, shaped by the necessity to maintain public trust leads to the fourth sub-question **SQ 4: Is the culture unsupportive of experimentation with AI due to fears that past AI failures might recur?**

Additionally, researchers argue that there is rigour stemming from the fact that public organisations need to navigate through layers of policy, compliance standards, and often public scrutiny before implementing new technologies (De Vries et al., 2015; Novelli et al., 2024). This suggests that due to regulatory and bureaucratic constraints public organisations are limited in flexibility for technology adoption (De Vries et al., 2015; Novelli et al., 2024). Management processes of public organisations are typically characterized as more rigid and transparent in comparison to private businesses, (Cabinet Office, 2021; The institute of internal auditors, 2014). These characteristics are expected to hinder AI adoption in municipalities because adoption research suggests that adoption initiatives benefit from flexibility (De Vries et al., 2015; Novelli et al., 2024). This leads to the fifth and final analysed relation **SQ 5: Do municipalities use traditional and rigid management structures that slow down AI adoption?**

3 METHOD

3.1 DATA COLLECTION

3.1.1 General information and empirical data collection

There are many complex and multifaceted challenges associated with the AI adoption of Dutch municipalities. More specifically there are adoption barriers, a lack of AI resources and capabilities, and other business environment factors or mechanisms that are hard to manage by stakeholders in the AI adoption process.

To gain a deeper understanding of these complex and interrelated challenges, a qualitative research approach was chosen for this study. Qualitative methods are particularly suited for exploring issues that involve multiple stakeholders, varying perspectives, and dynamic processes, as is the case with AI adoption in Dutch municipalities (Hammarberg et al., 2016; Teherani et al., 2015). By using qualitative methods, this study aimed to capture the rich insights of interviewees' experiences to explore underlying themes and patterns in the business environment, understand AI adoption barriers, and assess organisational AI readiness. This qualitative approach allowed for an in-depth exploration of the contextual factors and nuanced mechanisms which quantitative methods might overlook.

3.1.1.1 Desk study and interviews

The research was conducted through a continuous and iterative process that combined desk research and semi-structured interviews. The combination of desk studies and interviews enabled the simultaneous investigation of both research questions.

RQ 1: How can Dutch municipalities enhance their AI adoption?

RQ 2: Why are Dutch municipalities struggling with the introduction of high-risk AI applications?

Continuous desk research and interviews made iterative development and refinement of insights possible. This lead to a situation where findings from one research method and research question informed the other. This integrated research approach contributed to a more comprehensive understanding of AI adoption within municipalities and highlighted its current main challenges stemming from high-risk AI applications.

To gather the knowledge needed to make adequate sub-questions, interview questions, and ultimately answer the research questions a variation of literature sources were used including books, academic papers, media articles, exploratory interviews, podcasts, blogs, and more. The inclusion criteria for these sources were their relevance, credibility, and contribution to understanding the challenges faced by municipalities in AI adoption. While there was some starting level of knowledge the continuous desk research played a crucial role in identifying key themes and categories shaping a better focus of the interviews. The ultimate goal of the desk research was to find the theories and frameworks that were deemed to help the challenges of Dutch municipalities' AI adoption the most. The ultimate goal of the desk research was to identify the theories and frameworks that would be most effective in addressing the challenges of AI adoption in Dutch municipalities.

When an area of interest needed to be further investigated, an interviewee profile was developed. Multiple adequate candidates were requested to participate and contacted through emails or if possible through messages on LinkedIn. Participants were selected considering they had a decent understanding of what AI technology entailed, the area of interest, and their relevant relation to AI adoption in municipalities. Although public organisations such as the Ministry of Internal Affairs, the VNG, and the AP were invited for interviews they didn't participate. Other small municipalities could rarely be

interviewed as they often lacked AI expertise. Consequently, the final pool of entities interviewed for this research consisted of only municipalities, more specifically, Den Haag, Rotterdam, Oss, Tilburg, and ’s-Hertogenbosch.

While not all important stakeholder organisations could be interviewed this method still allowed for a sample size with multiple relevant perspectives on AI adoption. The interviewed profiles within municipalities included 1 project manager, 2 from higher management, 2 AI regulation experts, 1 business analyst, and 1 IT expert. Moreover, 3 AI experts from private organisations were also included in the study as external perspectives on AI adoption of municipalities. This was done as a benchmark under the assumption that they were less biased and more knowledgeable in comparing certain AI resources against other AI-adopting organisations. By capturing a range of perspectives and their respective insights, including potentially contradictory ones, the study aimed to develop and test the nuanced understanding of the challenges in the adoption of AI within Dutch municipalities.

A total of 10 interviews were conducted in person or via Teams and lasted between 30 minutes to an hour each. Semi-structured interviews were chosen to allow participants the freedom to discuss what they considered important regarding AI adoption and their field of expertise, while also having a structured framework to ensure that key topics identified in the literature and previous interviews were covered. Privacy considerations were also addressed by obtaining informed consent from all participants and ensuring their anonymity

As the research evolved, new areas of interest were analysed and integrated into both the desk research and interview processes if interesting and useful for formulating a comprehensive answer to the research questions. Ultimately leading to an as thorough and accurate as possible answer to the research question considering the data at hand.

3.2 APPROACHES FOR ANSWERING BOTH RESEARCH QUESTIONS

Both research questions were analysed using insights from the 10 interviews, but each required a different approach. While both answers were grounded in empirical findings, research question 1 focused more on practical information regarding the key barriers, whereas research question 2 aimed to deepen the theoretical understanding of the issues associated with high-risk AI applications.

3.2.1 Approach to answering RQ 1

To answer the first research question, **(RQ1: How can Dutch municipalities enhance their AI adoption?)**, the primary method was field research via semi-structured interviews with various stakeholders involved in the AI adoption process of Dutch municipalities. These semi-structured interviews, however, were supported by desk research. Insights gathered from this desk research enabled the iteration of interview questions and the development of a custom AI maturity model for data analysis (Table 5). The necessity to investigate the many factors impacting AI adoption in a continuously changing technological and regulatory environment led to the selection of this mixed method.

Initially, the desk research was guided by existing theories and models on technology adoption. A range of traditional models such as Rogers' Diffusion of Innovation model (Sahin, 2006), the Technology-Organisation-Environment (TOE) framework (Neumann et al., 2024), and RBV with DC theories (Teece, 2014) were explored. The RBV and DC frameworks were particularly appealing and explored in more depth due to their emphasis on identifying opportunities, assessing and acquiring resources, and transforming resources into capabilities, a critical aspect of AI adoption (see chapter 2.1.2.1). However, as the research progressed, a more tailored framework for AI technology was preferred, resulting in the use of AIMM (see chapter 2.1.2.3).

During the research, multiple AIMMs were discovered, which despite being under development (Sadiq et al., 2021), provided a more specific lens for examining AI adoption challenges. The evolving nature of this model meant that there were multiple versions, each with different categories and dimensions. Some of the areas defined in the literature were highlighted as particularly significant by the interviewees while others barely appeared during the interviews. These insights were crucial in shaping the direction of the research enabling a further in-depth exploration of important deemed topics or on the contrary a broadening of stakeholder selection and interview questions. With this strategy, the research question could be answered in a balanced way alternating between a more detailed or more holistic perspective.

Therefore the semi-structured interviews were conducted with a wide range of stakeholders involved in AI adoption within municipalities, including a project manager, higher management, AI regulation experts, an IT professional, a business process analyst, and external AI consultants. AIMMs from literature guided interview questions and enabled the identification of significant AI adoption challenges, and AI resources contributing to a deeper understanding of the current general practicalities in the AI adoption landscape of Dutch municipalities. As new insights emerged, the focus of the interviews evolved to gather insights on the most important deemed resources and capabilities in Dutch municipalities for effective AI adoption. For example, the fear of harming citizens with AI use significantly influenced the questions to become more specific, particularly regarding the investigation of AI resources related to regulation.

The data analysis process involved transcribing the interviews using Microsoft Teams' transcription tool. With these transcribed interviews a custom AIMM was developed and used as a coding tool to structure the data. The dimensions of this custom AIMM were chosen based on AIMM dimensions from literature and patterns within transcribed interviews. While not executed in this research this framework can be used to evaluate the AI readiness of Dutch municipalities in various dimensions.

Each relevant deemed quote from the interviews was numbered and categorized under its corresponding dimension of the custom AI maturity framework. By analysing the frequency and content of quotes, it was possible to identify areas of AI adoption that were more mature or on the contrary underdeveloped within Dutch municipalities. This analysis helped formulate targeted recommendations for enhancing AI adoption.

However, there were also challenges during the data analysis. A key challenge in the data analysis was managing the overlap between dimensions in the custom AI maturity framework. Some quotes were relevant to multiple categories. In these cases, the quote was classified under both dimensions to maintain the integrity of the insights. Additionally, an "Other" dimension was created for quotes that provided key insights but did not fit into any existing category. This category was reserved for significant information that fell outside the predefined dimensions, ensuring that valuable data was not overlooked.

3.2.2 Approach to answering RQ 2.

For the second research question **(RQ 2: Why are Dutch municipalities struggling with the introduction of high-risk AI applications?)**, the primary method of data collection was a comprehensive desk study. This method was chosen to gather existing theoretical knowledge about the mechanisms and challenges that contribute to (high-risk) AI issues. A notable source was Ajay Agrawal's (Ajay Agrawal et al., 2022) book, which provided an understanding of the transformation of decision-making processes when organisations implement AI for information processing. Other important information was collected via a variety of sources, prioritizing those that provided relevant and up-to-date insights into the ethical and practical implications when high-risk classified AI are used.

The sources included a wide array of categories such as; news articles, scientific papers, books, blogs, podcasts, and social media content from top voices in the AI field. This mix of categories was crucial

because of the fast-evolving landscape of AI and its associated risks and ethical discussions. Over time, the research focus became more refined. Sources that were too broad or not specifically related to high-risk AI or the context of municipalities were excluded to maintain relevance and depth in the analysis.

Additionally, interviews were conducted to (in)validate assumptions, deepen the understanding gained from the desk research, and assess theoretical challenges in practice. For instance, an assessed challenge from the literature was the diffusion of responsibility theory. This was analysed by asking questions about how responsibility was allocated within municipal AI projects.

Just as with research question 1 the interview questions and desk research evolved because of new insights from interviews or significant events such as the AI act. This led to further inquiries about the practical impacts of this regulation on municipal AI governance processes. For example, the entry into force of the AI Act during the research led to a deeper exploration of governance processes such as risk classification systems and impact assessments (IAMA, DPIA). By integrating desk research with the analysis of empirical insights, this study aimed to provide a thorough and nuanced conclusion on the underlying reasons why Dutch municipalities are facing significant challenges in implementing high-risk AI applications.

4 RESULTS

The result section discusses the empirical findings extrapolated from the interviews. It starts by discussing the developed custom AIMM and how by categorizing quotes it became clear which areas are currently perceived as important by Dutch municipalities and where information or attention could be lacking. More specifically, chapter 4.1 defines dimensions, what the chosen dimensions entail, and how the selection of dimension differs from the most similar AIMM developed by AI Signapore, (2024).

By analysing the reoccurring adoption challenges this research found that an AI adoption challenge was often spanning over a multitude of dimensions. Chapter 4.2 discusses the most significant practical AI adoption challenges present in the current AI adoption landscape of Dutch municipalities. These are practical findings that can be used to improve AI adoption.

Next to the results of the custom AIMM the interviewees presented information on the relations of business environment factors. In chapter 4.3 these diverse insights and quotes were combined into a comprehensive nuanced story that aimed to answer each of the sub-questions aimed to assess the relations between business environment factors. For all individual highlighted quotes and other empirically gathered information from the interviews check the appendix chapter 8.3 & 8.4.

4.1 CUSTOM AI MATURITY MODEL

AIMMs have emerged as strategic frameworks designed to guide the adoption of AI within organisations. These models facilitate the assessment of AI readiness by categorizing observations of key resources and capabilities that influence AI adoption in dimensions. The dimensions within AIMMs are often derived from a combination of expert insights and empirical data collected from surveys across multiple organisations (AI Singapore, 2024; Alsheiabni et al., 2019; Cisco, 2024; Saari et al., 2019; Sadiq et al., 2021). It is crucial to note that the description of these dimensions is often subjective, influenced by the specific context of the analysed organisation or industry and the individuals developing the model. This suggests that a one-size-fits-all model could be effective but may be suboptimal and AIMMs need to be adapted to the unique business environment being analysed.

In this research, a custom AIMM is developed as the AI adoption priorities differ significantly in public organisations than from those in the private sector. In chapter 4.1.1 the custom AIMM is compared to the AIMM model developed by AI Singapore, (2024) to enable discussion and elaboration on the choices related to the defining of dimensions.

In general the interviews showed that municipalities prioritize citizen service value. This focus resulted in an emphasis on the safe and responsible use of AI to ensure that AI systems align with public service goals and ethical standards. The custom AIMM developed in this research reflects these priorities, highlighting dimensions that are currently particularly relevant in the AI adoption landscape of Dutch municipalities, such as responsible AI governance and strategy development and communication.

Table 5 dimension comparison of custom AIMM and AIMM developed by AI Singapore, (2024)

Dimensions	Assessments	*Custom AIMM dimensions*
Management Support	Whether the organisation has allocated resources for AI initiatives	*Management support*
AI Literacy	Whether the employees could identify potential AI use cases and be savvy consumers of AI solutions	*AI opportunity literacy*
		AI governance literacy
AI Talent	Whether the organisation has the capabilities to develop, integrate, and maintain AI models	
Employee Acceptance of AI	Whether the employees trust and accept AI-bases systems	*Employee acceptance of AI*
Experimentation Culture	Whether the organisation has an experimentation culture for employees to explore and develop AI use cases	*Experimentation culture*
AI Governance	Whether the organisation has appropriate governance to avoid unintentionally harming end-users	*Responsible AI governance processes*
AI Risk Control	Whether the organisation has a proper classification of the risk level of AI systems	*AI maintenance*
Business Use Case	Whether the organisation has identified suitable AI use cases and assessed their value propositions	
Data Quality	Whether the organisation has processes to ensure the quality (accuracy, completeness) of data collected	*Data quality*
Reference Data	Whether there is a single source of truth, consistency of data format, and reliable metadata	
Machine Learning (ML) Infrastructure	Whether the organisation has appropriate and sufficient ML infrastructure (e.g., GPU, memory) to support AI model training and deployment	*Machine learning infrastructure*
Data Infrastructure	Whether the organisation is using appropriate data infrastructure (e.g., data lake) as a central repository of data	*Data infrastructure*
		Strategy development and communication
		Other

4.1.1 The dimension differences

In this study, AI literacy was split up into AI governance literacy and AI opportunity literacy. AI governance literacy was defined as the organisation's competence and depth of knowledge in understanding the ethical risks associated with AI use, while AI opportunity literacy categorized the observations related to the competence and knowledge needed to identify effective AI use cases. AI opportunity literacy therefore integrated the business use case dimension of the AIMM from AI Singapore, (2024). The choice for integration was based on the fact that it was deemed better to focus on resources and capabilities required for AI adoption within municipalities rather than tasks.

The concept of AI talent did not emerge as a standalone dimension in this study. Instead, AI talent is better understood as a conclusion that can be drawn from assessing other dimensions within the AIMM. The readiness of an organization for AI adoption can indirectly reveal the presence or absence of sufficient AI talent. For instance, if employees of municipalities demonstrate to be highly skilled in areas such as AI opportunity literacy, gathering quality data, and responsible AI governance, it can be inferred that they possess the necessary AI talent to support these functions. Therefore, rather than being a distinct dimension, AI talent is an outcome of the maturity assessment, reflecting the organization’s overall capability to leverage AI effectively.

The responsible AI governance processes dimension encompasses various processes including, risk classification, responsibility allocation, impact assessments, and continuous updating of AI models. While risk classification was separated in the AIMM from AI Singapore, (2024), the interviews revealed that AI maintenance was deemed of higher importance, currently often overlooked in Dutch municipalities. As a result, AI maintenance was chosen as a separate dimension in the custom AIMM rather than risk control.

In the custom AIMM, data quality and reference data were combined into a single dimension due to their interconnected nature. Interviews with stakeholders indicated that while data quality was a significant concern, reference data was not specifically mentioned as a distinct issue. By merging these dimensions, the model reflects a more holistic understanding of the factors that contribute to data reliability and integrity.

Lastly, strategy development and communication emerged as a critical dimension to be included in the custom AIMM. This dimension was not present in the model from AI Singapore, (2024) and was described as the crucial development and communication of AI adoption goals, and their respective resource-acquiring strategies. The inclusion of this dimension highlights the need for clear, strategic leadership in guiding AI initiatives and aligning them with broader public service objectives.

The "other" category in the custom AIMM captured observations that either span multiple dimensions or do not fit neatly into any defined dimension. This category is particularly useful for identifying key empirical insights that support the identification of current important AI adoption challenges and opportunities of Dutch municipalities.

4.2 KEY EMPIRICAL INSIGHTS

During the analysis of empirical information, multiple key empirical insights presented themselves. Firstly, the categorisation of quotes within the dimensions of the custom AIMM provided a clear indication of the volume of empirical data collected for each dimension. By analysing this distribution and insights from quotes in the dimensions, it became clear which dimensions are currently perceived as important by Dutch municipalities and where information or attention could be lacking (see chapter 4.2.1).

Secondly, during the interviews, multiple practical AI adoption barriers and suggestions for improvement were discussed. While each municipality was experiencing a different set of challenges some challenges were more frequently reoccurring and applicable to multiple Dutch municipalities than others. At the same time, interviewees expressed their opinions on the relative importance of certain challenges. The three most important practical AI adoption challenges were labelled as key empirical insights and are described in chapter 4.2.2.

4.2.1 Empirical insights from categorising quotes

Table 6 custom AI maturity model with categorisation of quotes

Custom AIMM dimensions	**Quotes related to it**
Management support	1, 2, 11, 40, 41, 56, 57, 77, 108, 121, 122, 123, 151, 152, 153, 154
AI opportunity literacy	13, 14, 15, 16, 17, 42, 43, 44, 45, 46, 47, 109, 110, 121, 124, 125, 155
AI governance literacy	6, 7, 26, 69, 7, 71, 87, 121,162, 163, 164
Employee acceptance of AI	5, 21, 22, 23, 24, 82, 83, 114, 115, 116, 117, 138
Experimentation culture	25, 84, 85, 118, 139, 140
Responsible AI governance processes	48, 49, 61, 62, 63, 64, 65, 66, 67, 68, 69, 86, 133, 159, 160, 161
AI maintenance	8, 27, 50, 51, 52, 72, 88

Data quality	52, 89, 141, 165, 166, 167, 168
Machine learning infrastructure	28, 93
Data infrastructure	28, 30, 90, 91, 92, 142, 143, 152, 169, 170, 171
Strategy development and communication	3, 4, 18, 19, 20, 58, 59, 60, 78, 79, 80, 81, 111, 112, 113, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 156, 157, 158,
Other	9, 10, 32, 33, 34, 53, 54, 73, 74, 81, 92, 94, 95, 96, 97, 98, 99, 119, 120, 144, 145, 146, 168, 172, 173, 174, 175, 176

The dimensions of **strategy development and communication** and **responsible AI governance processes** had a significant number of quotes related to it. This distribution suggests that municipalities are prioritizing high-level strategic and governance issues indicating these are the key concerns in the current AI adoption landscape for Dutch municipalities.

On the contrary, the fact that operational aspects like **AI maintenance** and **machine learning infrastructure** are given less attention implies that, although crucial, are not (yet) central in AI readiness discussions. This can be a potential gap in focus or expertise, but the focus of municipalities may also shift towards these operational dimensions over time. I suspect that over time the focus will shift from strategic to more operational dimensions. Logically, municipalities would prioritize navigating the regulatory landscape and developing strategic plans before committing to AI adoption resources and operational practices. Chapter 4.2.2 discusses three of the most significant empirical observations that add more validity to this argument.

4.2.2 The three most relevant deemed empirical insights

4.2.2.1 Regulatory uncertainty and AI governance literacy

Within municipalities, there is a significant focus on the risks associated with AI, particularly among higher management and stakeholders involved in AI application development. This concern stems from fears that AI applications might have negative impacts on citizens. Multiple ethical debates are being held on different levels of government with the aim to develop laws, governance guidelines, and assessment tools to support municipalities in the responsible creation and use of AI applications. However, the interviews revealed that many municipalities (mostly the ones relatively smaller in size) lacked adequate and robust governance processes.

During the time of this research, the AI Act was released, containing risk classifications for various types and contexts of AI usage, ranging from minimal to unacceptable risk (Artificial Intelligence Act, 2024). These classifications come with guidelines on the appropriate governance processes to use in each context, creating clarity for municipalities. This clarity helps municipalities in formulating practical processes for the ethical and responsible development and deployment of AI technologies. Moreover, the interviewees of the municipalities that already had some form of AI governance process noted that the AI Act reduced resistance from developers to governance processes such as ethical reviews and guidelines as this act drew their attention to the importance of responsible AI use.

Especially larger municipalities (G4: Amsterdam, Rotterdam, Utrecht, Den Haag) are actively participating in ethical discussions and collaborating with the Ministry of Internal Affairs to share knowledge and develop a national governance strategy and process. In contrast, smaller municipalities

are awaiting the creation of this nationwide strategy. Engaging in these ethical debates and developing governance support tools is recognized as necessary to avoid redundancy and centralize efforts. However, this process is also time-consuming, which delays the overall adoption of AI technologies.

Interviewees also highlighted the need for more AI governance literacy within municipalities. Different stakeholders, such as higher management, developers, and end-users, require varying levels of AI governance literacy. Higher management needs AI governance literacy to understand and formulate strategies, developers need the skills to classify AI and design measures to manage bias, discrimination, and respective risks, and end-users must recognize that AI applications are imperfect tools that if used irresponsibly can have ethically unwanted impacts.

Developing AI governance literacy is challenging, and municipalities struggle to educate stakeholders in critical positions. This difficulty is exacerbated by the rapid advancements in the AI field, which outpace the capacity of regulators and experts to keep up. Although multiple initiatives, such as engaging external parties and forming collaborations, have been undertaken to increase AI governance literacy, assimilating, communicating, and retaining this knowledge within the internal business environment remains an ongoing challenge.

Quote [121]: *"Then we said we first need to develop more knowledge about it. So we invited some people to come and give a lecture. We are also going to organize sessions within the organisation, more broadly, just to discuss what it is, what it can do, what you should and shouldn't do with it as an organisation. We said, well, building that knowledge... It's moving really fast, right? So, in that sense, I just notice it's moving so fast, it's almost impossible to keep up with the knowledge development."*

Quote [59]: *"If it is already being used, it is mainly done in the pilot phase now, within the analytics team. That is the team that also builds the algorithms, so they actually understand what is happening. I think that is now the biggest part of the strategy. Ultimately, we really follow the Ministry of the Interior and Kingdom Relations (BZK) here, so when they come up with a strategy or the Association of Netherlands Municipalities (VNG), we will follow. Because we don't really believe that every municipality should write separate policies on this, as that is not going to work. You will end up with one municipality fully running on AI and another still doing everything on paper, to put it extremely."*

4.2.2.2 Human resources

Secondly, the interviewees often discussed human resource challenges but also respective initiatives to tackle them. Ministries have allocated funds for AI adoption, and just as with the regulatory uncertainty challenge, there are lots of collaborations between municipalities, the ministry of BZK, private sector AI experts, and the VNG to acquire AI resources.

The main challenges were related to human resources. On the one side, there was a lack of AI opportunity literacy especially for the employees who were not directly related to developing AI applications but had specific domain knowledge. Moreover, there was a lack in the amount of AI-focused personnel to handle the workload of AI adoption. Especially smaller municipalities are struggling with these challenges to keep knowledge inside the organisation and attract AI-skilled personnel.

To tackle the challenges municipalities resorted to outsourcing some of the AI application development and acquiring AI knowledge via training and lectures from AI experts in the private sector. However, interviewees state this approach has its problems by becoming dependent on these external parties. Even if AI development gets outsourced, which is wanted in some cases, communicating the requirements and checking the quality of externally developed AI applications is still required. External parties also mention that because of the lack of AI opportunity literacy, AI adoption is very much technology push instead of market pull driven .

Quote [57]: *"I think the municipality, in itself, has the right people for this. Yes, resources? There are always more people needed. There is always a shortage. It is always busy. So, of course, in terms of resources, I think we are mainly focusing on the human aspect right now."*

Quote [123]: *"Yes, that is really a continuous challenge. That's why we also try to collaborate as much as possible with others and use what we have in a smart way. As a municipality, you don't have unlimited resources, especially not looking towards the future."*

4.2.2.3 Sharing data, models, and infrastructure

In the Netherlands there is a fragmented landscape of municipalities IT infrastructure. Many municipalities operate their own IT system or share it with a small number of municipalities. Multiple stakeholders in the Netherlands have recognized the potential benefits of sharing data, models, and infrastructure and examples such as Denmark's connected government IT are supporting this (Vogelaar, 2024). To facilitate this sharing and move to a more central system in the Netherlands as well multiple initiatives and platforms have been established. For instance, "Common Ground" initiated by the VNG aims to create general dominant processes for the tasks that are similar in municipalities (Vogelaar, 2024).

Municipalities currently share their datasets through various websites, making them accessible for other municipalities and sometimes the public. In addition to data, municipalities also share AI models and algorithms. Sharing models allows municipalities to leverage each other's expertise and reduce the redundancy of developing similar models independently. However, ensuring the compatibility and reliability of shared models remains a challenge, especially for smaller municipalities that may lack the resources to thoroughly evaluate and modify models that were not developed in-house.

However, a major challenge in resource sharing is the reluctance of municipalities to relinquish control over their data and infrastructure. Concerns about compromising security, losing autonomy, and becoming excessively dependent on a centralized system are common concerns. Interviewees expressed scepticism regarding the feasibility and long-term success of the Common Ground initiative.

Quote [171]: *"Our former municipal secretary was quite high up in Common Ground. What we get back from them is that municipalities have an incredible amount of difficulty letting go of their autonomy, and that often has to do with fear. Fear for safety, for control over your infrastructure and its security, and for being able to decide for yourself whether or not you find an application safe enough".*

Quote [92]: *"Ultimately, you want common ground, and that's a very nice concept. But it also feels a bit utopian to me. Because then you just have to look, then you have to have the same applications, for example. Yes, yes, and if you do that, then there will be a monopoly of these system administrators who will then sit back on their lazy butts because they have all the municipalities and no longer have any motivation to innovate their system and applications. So the common ground principle is nice on the one hand, but on the other hand, it doesn't always work that way".*

4.2.2.4 Note on gathering feedback for AI adoption

During the interviews, it became apparent that for many municipalities the key step to improve AI adoption is to refine AI adoption feedback mechanisms, whether formal or informal. Empirical insight suggests that by gathering information on the current AI readiness of different AI adoption dimensions and insights into the practical barriers, organisations can steer AI adoption efforts more effectively.

As highlighted in Quote [153], the process of surfacing and transferring feedback within municipalities often remains undefined.

Interviewer: "How does the feedback surface, and how do you transfer that to either a strategist or someone in higher management, or directly to the people within the municipalities who are actually working with those tools (AI)?"

Interviewee: "To be honest……, if you're interested……, there is no established process for it."

4.3 ANSWERS TO SUB-QUESTIONS

In chapter 4.3 quotes and insights from interviews are used to answer the sub-questions and develop an understanding of the relations between the factors and concepts that were outlined in the conceptual framework (Figure 5). This chapter delves into how municipalities define AI adoption success, respond to public perception, and asses the assumptions on resources affecting the AI adoption process. The answers to the sub-questions were generalized for all Dutch municipalities so it is important to note that individual municipalities may differ. Ultimately, these insights into the relations of business environment factors on the AI adoption process could support the strategic management in enhancing municipalities' AI strategies.

4.3.1.1 SQ 1: Will municipalities' AI strategies aim for a defined subjective adoption ''success''?

No direct evidence could be found that municipalities have a **defined** subjective adoption success. However, insights from the interviews suggest that municipalities often do have a subjective interpretation of AI adoption "success". Most municipalities see AI adoption success through a dual lens: citizen service value increase and AI adoption costs. The concept of AI maturity levels, as introduced in previous chapters, offers a framework for assessing the progress of municipalities in adopting AI. Even though no strategy documents were analysed, the insights from interviews suggest that AI adoption goals or AI maturity levels are not clearly communicated within municipalities.

This desired AI maturity level could guide the development of AI strategies. However, defining the aimed-for AI maturity level poses challenges, as it is influenced by multiple business environment factors that change over time. This shows how multifaceted and complex the defining of an AI maturity level or AI adoption goals can be. Municipalities must navigate these complexities to develop effective AI strategies that balance ambition with realism, ultimately enhancing both operational efficiency and citizen satisfaction with the costs of AI adoption and its ethical risks.

Quote [76]: *"But if for whatever reason they find out that it doesn't work or that, well, from external development, it's said, 'This is not desirable,' then we'll just stop it. But the real strategy. That will mainly come within governance."*

Quote [105]: *"Yes, I think, but I believe that's very clear to you as well, that AI should never be the goal, it should always be a means. I think that's the most important."*

Quote [119]: *"But now there's a broader look, more towards the concept of customer value, so it doesn't necessarily have to save money, but for example, the quality can improve or the waiting time for a customer can go down... And then, for example, the approach is okay, an employee doesn't need to perform those tasks anymore, but has more time to call a citizen for a home visit or invite a citizen."*

4.3.1.2 SQ 2: Is the negative public perception stemming from past AI cases significantly influencing the subjective interpretation of successful AI adoption and therefore municipalities' AI strategies?

Sub-question 2 is supported by the empirical outcomes of this research. Municipalities' strategies are influenced by historical instances of AI that supported the exacerbation of discrimination. This is shifting the focus of AI strategies to predominantly emphasize safety, ethics, and the overarching principles of responsible AI. While concerns over discrimination are a crucial element they are,

however, not the sole driver. In developing their AI strategies. Municipalities have a citizen-centric approach where they aim to provide the best possible service for citizens. The commitment to ensuring AI applications are used responsibly aligns with this broader goal.

Notable cases include the Dutch childcare benefits scandal and the use of discriminatory algorithms in Rotterdam. These cases have highlighted the potential harms of AI when not properly governed. Recognizing the power of media in shaping public opinion, municipalities emphasize transparency and ethical considerations in their AI policies to avoid similar scandals. Their AI strategies are, therefore, also driven by a concern over the potential loss of public trust.

Quote [78]: *''Two years ago, there was a case XXXXX, you probably heard about it. Well, it came down to a municipal algorithm that was found to be discriminatory, and it was subsequently stopped. You can still feel the effects of that. My role actually emerged from that, to prevent such incidents. ... And I think the political landscape, as I mentioned before, has understandably become more critical of these issues.''*

Quote [100]: *''Of course, the fear of being publicly shamed plays a role. We want to regain the trust of the citizens, so we prefer not to take any risks to ensure we regain that trust.''*

Quote [149]: *''No, the city council, yes, yes, we still need to establish the ethical aspect, but we've already had several discussions with the city council about what should be done in that regard. It's not entirely new because everything we do involves making ethical considerations... The only difference is that it has become much more urgent and scrutinized, especially due to past mistakes by government bodies.''*

4.3.1.3 SQ 3: Is the subjective interpretation of 'successful' AI adoption influenced by the perceived current level of resources and capabilities?

Insights from interviews show that the AI adoption strategy in municipalities is significantly influenced by the perceived current level of resources and capabilities, particularly in terms of knowledge, data and workforce. The size of a municipality appears to play a critical role in shaping its AI adoption strategy.

Larger municipalities, such as those in the G4 (Rotterdam, Amsterdam, Den Haag, and Utrecht), possess greater resources and capabilities, enabling them to take a more proactive approach to AI adoption. Municipalities have a great focus on collaborations. Larger municipalities (G4) share knowledge and collaborate to develop necessary new governance processes and strategies for AI adoption. Their biggest challenges are both forms of AI literacy and acquiring and attaining AI capable workforce.

In contrast, smaller municipalities tend to adopt a more reactive stance. A concrete example is the statement of multiple interviewees that they are waiting for the G4, the Ministry of the Interior and Kingdom Relations (BZK), and the European Union (EU) to provide governance guidance and frameworks before developing their own specific AI strategies. Medium and smaller-sized municipalities also face challenges in internalizing AI resources, but to a bigger extent than large municipalities. The biggest challenge is their dependency on external stakeholders and a limited number of internal employees capable of facilitating AI adoption initiatives. Additionally, they typically have less data available to develop tailored algorithms or models independently.

Quote [36]: *"Well, the municipalities that are ahead, those are really the larger municipalities in the Netherlands, like The Hague, Amsterdam, Rotterdam, Utrecht, Eindhoven, Den Bosch, Breda. You know, they also have really professional data or AI clubs, and they are developing things, and it almost seems to be somewhat related to the size of the municipality. If the municipality falls below a certain*

number of inhabitants, then they simply don't have enough money or time to tackle it seriously, so to speak."

Quote [102]: *"So, I don't think it lies with the data piece. The resources piece, when it comes to people, I think that we, like every organisation, of course, have shortages and that kind of thing, but there are really people here who are willing and able. And I think you also have to look at what my vision is here. Do you want to phase out a part, and that via consultancy companies is, I think, just what you want. You want to simply outsource parts."*

Quote [179]: *"We are all waiting for that regulation, because especially for a municipality with less money of our size. Yes, you can't spend that money twice because you don't have it. Sometimes it is just that simple, so you'd rather wait for that regulation first."*

4.3.1.4 SQ 4: Is the culture unsupportive of experimentation with AI due to fears that past AI failures might recur?

The empirical insights of the interviews showed that public distrust is indeed hindering the integration of new AI applications. Ethical concerns are one of the primary factors for higher management to accept and implement AI initiatives, stemming from the fear that AI applications could unintentionally harm individuals or racialized groups of citizens. As a result, higher management prioritizes risk mitigation and adopts a cautious approach to AI implementation. This is particularly evident in internal projects that develop high-risk AI applications. Some municipalities completely refuse to deploy AI applications if they are classified as high-risk AI applications.

Other municipalities implement governance guidelines and ethical checks, such as the Impact Assessment Human Rights and Algorithms (IAMA), Data Protection Impact Assessments (DPIA), and Algorithm Risk Assessment (ARA) to asses and manage the unwanted impact of high-risk AI applications. These assessments guide the discussion on the ethical implications and help project groups design AI responsibly. However, developers have also expressed frustration with the slow pace of these processes, as they involve numerous stakeholders and lengthy evaluations.

However, this reluctance for high-risk AI projects does not necessarily indicate a lack of an experimental culture within these organisations overall. The culture within municipalities remains experimental for less risky applications, driven by the enthusiasm of employees who are eager to use AI as a tool to automate repetitive tasks and enhance efficiency. This culture is heavily dependent on the AI governance literacy of higher management as they are responsible for deciding on the experimentation strategy.

Quote [35]: *"I think the biggest barrier is often the fear of legislation. Fear of the GDPR, fear of the AI Act, fear that your organisation's image will be damaged or that you will be disgraced, right? There are quite a few advantages too. I think this is mainly within the management and the directors who are afraid of failing. And yes, that also has to do with a lack of knowledge."*

Quote [65]: *"Yes, well, I can only speak for my discipline, but we have developed a tool within the municipality, the Algorithm Risk Assessments, the ARA, which consists of three parts."*

Quote [79]: *"Okay, do you happen to know the motives why they would apply the brakes? ... Yes, it's fear of the unknown and conducting such trials. Very often things happen, 'Oh, it's a pilot, and it went into production.' You know. That line is then suddenly quite thin. And by saying so strictly that we are breaking it off, they are certain that it will not go into production at least."*

Quote [107]: *"So, things like generative AI play a significant role in a customer contact centre. If we look at, for example, invoice processing, a lot of intelligent document processing is happening right*

now. So how can we better process those invoices? From many sides, you notice that everyone thinks, 'Hey, interesting.''

4.3.1.5 SQ 5: Do municipalities use traditional and rigid management structures that slow down AI adoption?

Knowledge about AI adoption requirements highlights that a flexible, experimental mindset is crucial (Fountaine et al., 2019). Interviewees generally supported the notion that an experimental approach is essential for successful AI projects. Evidence suggests that municipalities do not uniformly adhere to traditional and rigid management structures when it comes to AI adoption. Several municipalities exhibit an experimental and agile structure for AI projects.

Empirical evidence showed that traditional waterfall systems are still prevalent between and within municipalities, especially in dimensions related to governance development concerning AI. This methodology often leads to delays as municipalities may spend extensive time in the approval stages of AI development.

In regards to the type of projects one interviewee, who was responsible for another more mature digitalization technology using AI plugins, noted that they do, however, typically employ the traditional waterfall structure. This was due to the similarity and predictability of projects and their outcomes. The interviews show that a combination of management structures and mindsets is used depending on the experience with the technology.

Quote [38]: *"And they also know that these kinds of projects need to be approached very interactively, right? So methods like agile and terms like scrum and sprint work really well. But there are also municipalities that are still stuck in the old framework of the waterfall model. And they think they need to figure everything out completely, arrange everything perfectly, and set money aside, maybe even get approval from the municipal council. Yes, and those are really the wrong strategies, so there are real problems there."*

Quote [106]: *"For the part of RPA (Robotic Process Automation) with that piece of automation, we are so ingrained that we no longer do POCs (Proof of Concepts) on it. We know it works, we don't do it in an Agile scrum way. We do it in a waterfall way. We create a minimally viable product, test it thoroughly, and wait for approval from the business with the tests, and then we go live with it. So because we already have the experience of knowing how it works, you now have a waterfall structure and it's easier to build the same thing?..... Exactly. Exactly, yes. And the part of AI that we are now getting involved with. Machine learning AI. We are still in a different phase with that, a different way of working, and that is to first make a POC and see if it has added value."*

Quote [176]: *"We are all waiting for those national regulations, right?..... Interviewer: Yes, those national regulations have to come from the Ministry of the Interior and Kingdom Relations (BZK), right?..... Yes, there are already guidelines, all sorts of things that you can already fill in, and they have already made certain fields mandatory. But we are all still waiting to see what those regulations will look like, because it is quite possible that they will deviate from the EU AI Act, as they have done so far. At least, the proposal deviated significantly."*

4.3.2 Conclusion on sub-questions analysing the relations of business environment factors on AI adoption

In Figure 5 the results of the sub-questions are represented in the conceptual model. A green plus means the answer to the sub-question was yes and a red minus means the answer to the sub-question was no.

Most of the assumptions were validated; however, the most significant outcome was the deeper understanding gained from analysing the interrelationships between the factors.

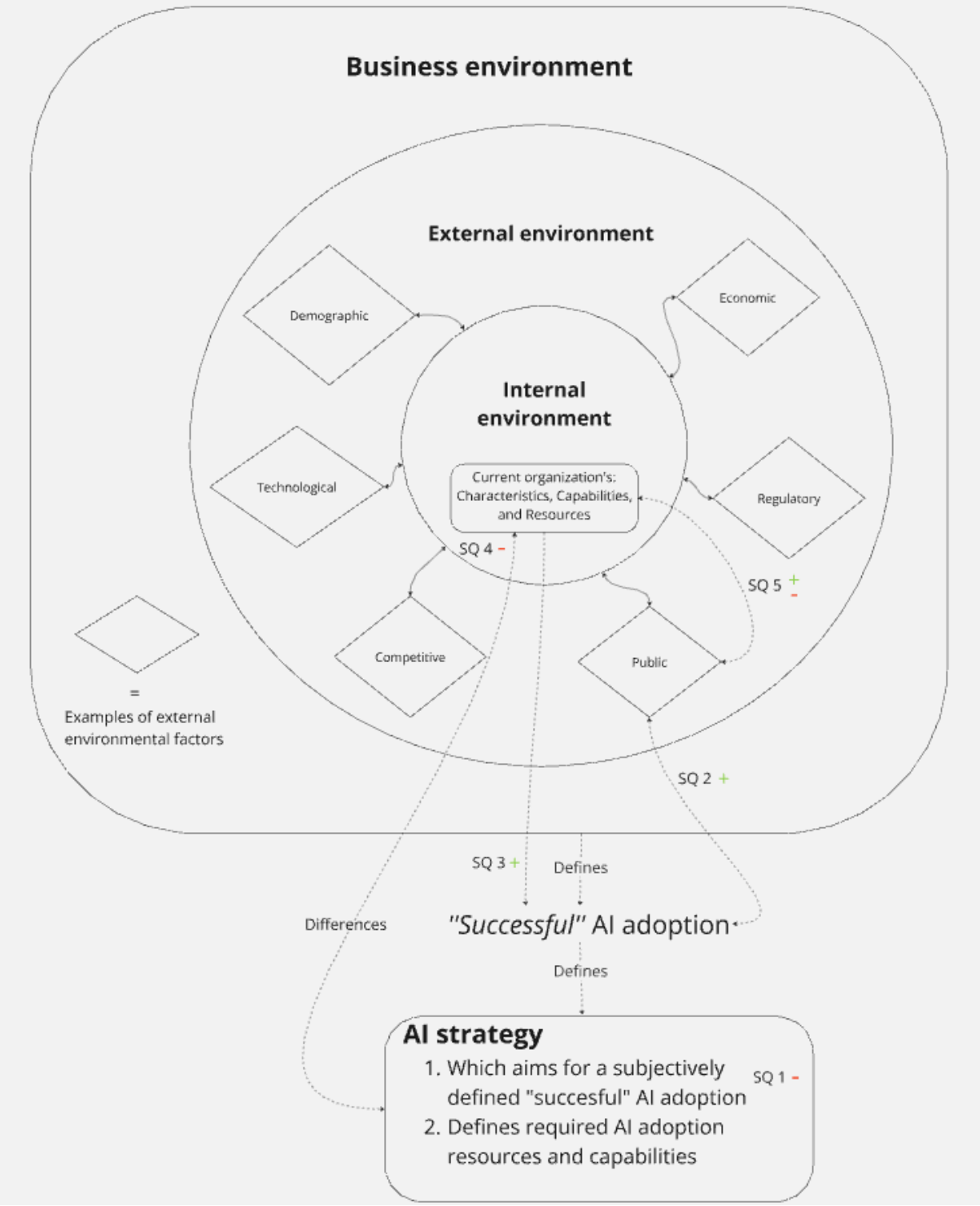


Figure 5 conceptual framework of research with results of assessed relations

5 CONCLUSION

As we draw this study to a close, it is essential to revisit the core research questions that have shaped this study. The first research question **(RQ1: How can Dutch municipalities enhance their AI adoption?)** sought a potential method to strategically guide municipalities' AI adoption and execute this method to find current AI adoption barriers within the AI adoption landscape of Dutch municipalities. The second research question; **(RQ 2: Why are Dutch municipalities struggling with the introduction of high-risk AI applications?)** aimed to get a better understanding of the underlying factors and mechanisms at play by the use of high-risk AI applications.

By addressing these questions, this study provides a comprehensive insight into the current state of AI use by Dutch municipalities, how AI adoption can be improved, and why municipalities were specifically vulnerable in the use of high-risk AI applications.

5.1 HOW CAN DUTCH MUNICIPALITIES ENHANCE THEIR AI ADOPTION?

To effectively advance AI adoption, organisations must develop a comprehensive understanding of the business environment factors affecting their AI adoption process. Moreover, municipalities must gather information on the most pressing adoption barriers hindering the development of AI readiness. By identifying the key adoption barriers municipalities can create targeted strategies for the enhancement of AI adoption-related resources and capabilities. This will improve AI readiness and facilitate successful AI integration. Within this research, an AIMM and its dimensions were used to analyse interview data. This seems like a promising method for the extraction of key insights relevant to improving AI readiness.

While municipalities encounter unique challenges based on their AI maturity levels across various dimensions, the focus here is on the conclusion that applies universally to all municipalities. Currently, the most significant challenge is the formulation of a comprehensive AI adoption strategy, especially regarding governance. Almost all of the interviewees said that the regulation uncertainty and the complexity of responsible AI use were the main adoption barriers present in the AI landscape of Dutch municipalities. Municipalities must first develop an AI adoption strategy that emphasizes governance processes to effectively assess the potential positive and negative impacts of implementing specific AI applications.

Additionally, there is the internal business environment with its resources and capabilities. Higher management in municipalities appears willing to invest in AI, but they also recognize that resources are finite. The primary resource constraint is the shortage of skilled personnel, which complicates efforts even if municipalities want to invest in AI initiatives. Empirical insights indicate that collaboration within government entities is a key method for acquiring knowledge, sharing IT infrastructure, and exchanging data, all of which could enhance overall Dutch municipalities' AI readiness.

5.2 WHY ARE DUTCH MUNICIPALITIES STRUGGLING WITH THE INTRODUCTION OF HIGH-RISK AI APPLICATIONS?

High-risk AI often containing privacy-sensitive data can enhance efficiency in various tasks, however, they inherently carry the risk of supporting unfair practices. By introducing, high-risk AI applications, such as those used for fraud detection, discussions arise about the fairness and therefore overall citizen value of these models. Municipalities have to carefully choose which type of AI applications are worth the efficiency benefits compared to their risks of negative impacts on citizens such as exacerbating discrimination.

This focus on fair and responsible AI implementation is increased because of fear of bad publicity. This is the result of previous AI applications that were perceived to exacerbate discrimination. The complexity of the balancing of efficiency gains and risk together with the fear of bad publicity resulted in municipalities holding back on the adoption of high-risk AI and focusing their efforts on governance strategy developments.

Larger municipalities and central government are currently developing nationwide AI governance strategies to tackle this problem but uncertainty and the complexity of responsible AI use make this challenging. Smaller municipalities are awaiting these broader governmental governance strategies since they don't want to waste resources on developing strategies and AI capabilities that could be proven redundant in the near future. However, developing these governance strategies is challenging due to a lack of AI governance literacy, a shortage of skilled professionals, and a constantly changing environment.

Throughout the study, some improvements in AI governance processes were observed. For instance, the AI Act helped municipalities in AI-system risk classification. Within these governance processes municipalities and organisations are increasingly utilizing standardized processes and frameworks like the ARA, IAMA and DPIA to address biases and ethical concerns and assess their impact on citizens. By following these governance guidelines and checks, they ensure thorough discussions on the ethical implications of AI implementations, thereby reducing the likelihood of introducing new unwanted AI applications.

6 DISCUSSION

This discussion chapter interprets the results of the study, evaluates the validity of the research methods, and explores implications for future research. The findings related to research question 1 offer insights for enhancing AI adoption in Dutch municipalities and discuss the foundational methods of analysing AI adoption in (public) organisations. The findings related to research question 2 help us understand the underlying mechanisms of the ethical challenges of high-risk AI applications.

6.1 INTERPRETATION OF RESULTS

6.1.1 Research question 1: How municipalities can prepare for AI adoption

As the goal was to support municipalities in the AI adoption process the focus of the desk study and interviews quickly shifted to strategic management. This method proved successful as the accumulation of relevant information, combined with the use of a custom AI maturity model, enabled the research to identify key barriers to AI adoption currently faced by municipalities. Dutch municipalities were in general prioritizing high-level strategic and governance issues and were often experiencing a lack of AI governance literacy, uncertainty in the AI regulation landscape, complexity of responsible AI implementation and governance practices, and other AI strategy development challenges regarding the acquisition of AI resources. However, the research found that each municipality's approach to AI adoption must be tailored to its unique business environment and is likely to change over time.

The use of an AI maturity model was instrumental in this study, providing a structured framework to analyse interview data and identify specific dimensions where municipalities lack the resources and capabilities essential for AI adoption. While the specific challenges may vary addressing these barriers is crucial for municipalities to successfully integrate AI technologies and harness their potential benefits.

The empirical insights highlight that the current primary barriers to AI adoption in Dutch municipalities are related to responsible AI practices, hence RQ 1. Especially the lack of understanding in top management prevents municipalities from developing coherent strategies for AI adoption, as leaders struggle to conceptualize what constitutes "successful" AI adoption balancing the potential values and risks. This issue is compounded by the fact that AI is a rapidly evolving field, with complex and often opaque technologies that require specialized knowledge to fully comprehend. Without this literacy, municipalities face difficulties in defining clear objectives and evaluating AI solutions that align with their organisational goals and ethical standards.

6.1.1.1 Connection to Existing Literature

The findings of this research align with existing literature that emphasizes the importance of organisational readiness in AI adoption. Studies such as those by (McAfee & Brynjolfsson, 2017; Mikalef et al., 2019a) have highlighted that a lack of digital literacy among leadership is a common hindrance to technology adoption in public sector organisations. Additionally, the emphasis on developing a tailored approach for each municipality resonates with the findings of (Alsheiabni et al., 2019), which stress that AI adoption must consider specific organisational contexts and environmental factors.

Furthermore, the use of AI maturity models as diagnostic tools is well-documented in the literature, offering a systematic way to assess and improve organisational capabilities for AI integration. For example, (Cisco, 2024; Mikalef et al., 2019b; Sadiq et al., 2021) discuss how maturity models can be used to identify gaps and formulate strategies for technological advancement.

The comparison between the custom AIMM and existing models from the literature underscores the complexity of AI adoption. While many dimensions are consistent across different models, the

variations observed in this study highlight that a one-size-fits-all approach is not feasible. Instead, AIMMs must be adapted to the specific context in which they are applied. This study challenges the notion of a universal model, suggesting that while certain dimensions may be universally relevant, their application and significance can vary significantly across different organizational environments.

6.1.2 Research question 2: Why municipalities struggle with responsible AI use

The research findings reveal that Dutch municipalities face significant challenges with high-risk AI applications due to their inherent mission as public organisations and the potential negative impact on citizens. These institutions are tasked with serving the public interest, which inherently includes promoting inclusivity and equity. However, the use of AI systems that for example use privacy-sensitive data, or engage in profiling can lead to discrimination, directly conflicting with the municipalities' objectives. This tension creates a substantial ethical dilemma, as municipalities must balance the trade-off between task efficiency and the risks of AI implementation.

Municipalities are careful in deploying AI technologies that might harm the public interest by contributing to unjust treatment. This is exacerbated by the immaturity of the technology and its current uncertain regulatory environment. As guidelines and public opinion continue to evolve, municipalities find it difficult to establish a clear and ethical path forward. Additionally, the complexity of AI systems makes it challenging for municipal stakeholders to fully understand the nuances of these technologies, hindering informed decision-making.

Moreover, the characteristics of government organisations contribute to some of these challenges. Despite an experimental mindset towards AI development, the bureaucratic nature of municipal governance slows down AI adoption. While this cautious approach may be seen as a hindrance to rapid innovation, it does align with the municipalities' emphasis on safety and fairness. This emphasis on safety and fairness arguably necessitates a more deliberate pace in AI adoption, ensuring that ethical considerations are adequately addressed before widespread implementation.

Additionally, AI models introduce a bias-illuminating aspect, making distortions in data and decisions more visible (F. Chen et al., 2024; Resnik & Hosseini, 2024). This increases organizational accountability for predictions made by AI models (Schwartz et al., 2022; Smith & Rustagi, 2021). Consequently, public discussions on systematic unequal treatment have intensified with some viewing this as an opportunity to create fairer systems designed to counteract human bias (Blackman & Ammanath, 2022; Ferrer et al., 2021; Janssen & Sadowski, 2021).

This underscores the critical importance of external validation processes to ensure that AI applications align with fairness standards. However, achieving effective external validation can be challenging, especially when sample sizes are insufficient to represent the population accurately. As a result, continuous discussions around bias and fairness are essential to guide AI efforts towards the most equitable outcomes.

6.1.2.1 Connection to Existing Literature

The challenges faced by Dutch municipalities align with existing literature that highlights the pervasive issue of bias in AI systems and its ethical implications. Cases have consistently shown that AI technologies can perpetuate and even exacerbate historical biases present in training data, leading to unfair outcomes (Janssen & Sadowski, 2021). This is particularly concerning in public sector applications, where the stakes of irresponsible AI use are increased due to the direct impact on citizens' lives.

Furthermore, the bureaucratic nature of public organisations often contrasts with the agile approaches seen in private sector AI development, leading to slower adoption rates (Borins, 2001; De Vries et al., 2015; Mikalef et al., 2019a; Neumann et al., 2024). This research identifies that public organisations prioritize safety and fairness over rapid technological advancement.

6.2 LIMITATIONS

In conducting this research, several limitations were encountered that may influence the interpretation and applicability of the findings. While these limitations do not undermine the study's significance, they highlight areas where caution should be exercised when drawing conclusions or applying the results to broader contexts. Recognizing these limitations is essential to improving future research efforts in AI adoption and effectively addressing AI challenges in public organisations.

6.2.1 Methodological Limitations

To enhance the reliability and validity of the research, I aimed to include a diverse range of sources and perspectives. This approach was intended to develop a comprehensive understanding and a well-informed narrative. The interviews conducted were of generally high quality, and no significant disturbances affected the data collection process. However, the total of ten interviews, while deemed sufficient for the depth of insights required, represents a limitation in terms of sample size. A larger number of interviews could have provided a broader range of perspectives and more nuanced results. Particularly, insights from key organisations such as the Ministry of Internal Affairs and the Association of Dutch Municipalities (VNG) could have enriched the understanding of challenges in establishing overarching policies or central IT infrastructure for shared AI model platforms. Time constraints and limited responses prevented the inclusion of these perspectives.

6.2.2 Theoretical Limitations

AI adoption, particularly concerning discriminatory applications in public organisations, is a relatively novel field with limited literature. The framework and dimensions used for analysis were established prior to conducting interviews, but alternative dimensions could be defined by other researchers. This variability in dimension relevance is noted in the literature, which indicates ongoing discussions about the AI maturity model's dimensions and their theoretical validity. This potential lack of consensus weakens the framework's status as a holistic tool and raises questions about its overall validity.

Nevertheless, the AI maturity model proved useful in organizing AI adoption requirements and guiding the investigation. By applying the framework to a range of organisations, it became evident that resources and strategies varied significantly, with certain dimensions being more critical for some municipalities than others. This variability highlights the model's flexibility and practical utility, even though it may not encompass every dimension relevant to all contexts.

6.2.3 Practical Limitations

The application of AI maturity models in municipalities can help categorize AI adoption resources and clarify strategy development. However, understanding the underlying problems and mechanisms often requires detailed interviews. Privacy concerns also emerged as a practical limitation. Given the media scrutiny and loss of public trust related to AI applications, interviewees were hesitant to provide candid insights, fearing potential criticism. This sensitivity affected the depth of information shared and limited the pool of available experts. Many experts were engaged in addressing ongoing challenges and were reluctant to participate in interviews, further constraining the research.

6.2.4 Generalizability

The generalizability of the findings is another limitation. This study focused specifically on Dutch municipalities, and while the insights are valuable within this context, they may not be directly applicable to municipalities in other countries with different regulatory, cultural, or organisational settings. The unique characteristics of Dutch municipalities, including their governance systems, may limit the applicability of the findings elsewhere. Future research should aim to include diverse geographical contexts to enhance the generalizability of the results.

6.3 IMPLICATIONS

6.3.1 Implications for Municipalities

AI technologies offer unique opportunities to improve public services and urban management. However, they also face significant challenges, particularly regarding ethical considerations and governance. To enhance their AI adoption effectively, municipalities must address these issues. The following sections detail these practical implications and provide insights to guide municipalities on their AI adoption journey.

6.3.1.1 Municipalities' part in policies for fair systems

Municipalities should advocate for clearer regulatory guidelines and actively participate in broader ethical discussions regarding AI use in public sector applications. By engaging with policymakers and other stakeholders, municipalities can help shape policies to align AI technologies with the values of fairness and inclusivity inherent to their public service mission. The aim of policies should not be to eliminate bias entirely, as this is impossible, but to design AI applications that add value without exacerbating unfair or other unwanted service outcomes.

To achieve policies with a strong ethical foundation, municipalities need to increase AI governance literacy. This part of AI literacy encompasses a deeper understanding of the risks associated with AI models, particularly high-risk AI systems. Municipalities must focus on building a skilled workforce capable of weighing the positive and negative impact of AI systems and how to develop and manage these systems equitably. This involves not only attracting new talent but also upskilling existing employees to ensure they can effectively contribute to the responsible use of AI. A well-trained workforce will be instrumental in overcoming governance and further more general AI adoption barriers.

6.3.1.2 Robust Governance Processes for AI in Municipalities

Further supporting the equitable adoption of AI, municipalities must implement robust governance processes that foster continuous dialogues around value, fairness and inclusivity. Robust governance involves transparency, privacy, accountability, stakeholder engagement, and continuous maintenance. These components ensure that AI systems operate and align with societal values and organisational goals.

A currently promising approach is the Algorithm Risk Assessment (ARA) framework, which classifies algorithms based on their potential risk levels. The ARA framework can be used to identify high-risk algorithms which require strict evaluation and oversight and make plans to do this. Moreover, when an algorithm is classified as high-risk, municipalities can employ tools like the Impact Assessment Human Rights and Algorithms (IAMA) to further analyse and manage associated risks. This ensures that any biases and unfair outcomes which are present in AI systems are systematically addressed. Organisations are responsible for discussing the implications of AI errors, such as type 1 (false positives) and type 2 (false negatives) and developing risk management strategies to minimise these errors.

External validation of AI models with representative real-world data helps evaluate model performance. However, this is not enough for responsible AI use. Municipalities should actively collaborate with the public to identify situations of unjust treatment by AI systems.

An iterative approach to AI adoption is crucial. Municipalities must recognise that public opinion and ethical standards evolve over time. By embracing adaptability, they can make ongoing adjustments to AI systems, ensuring alignment with societal values and public interests. This iterative process involves regular reviews of AI performance, incorporation of citizen feedback, and policy adjustments when needed.

6.3.2 Implications ministry of internal affairs and VNG

6.3.2.1 Policymakers' (Ministry of Internal Affairs) part in policies for fair systems

The role of policymakers, particularly the European Parliament and Ministry of Internal Affairs, is critical in shaping policies that ensure the ethical and responsible use of AI applications in the public sector. Policymakers must establish comprehensive governance frameworks that prioritise ethical standards, and accountability and put citizen value at the centre of AI development. Adopting a human-centric approach considering the social and cultural implications versus the operational benefits of AI can support these technologies to add value for societal well-being. Furthermore, regular audits and accountability measures are necessary to maintain public trust and ensure that AI systems are being used responsibly.

Policymakers should also encourage collaboration and stakeholder engagement to discuss policies. Engaging municipalities, technology experts, civil society organisations, and the public is essential in gaining diverse perspectives and creating inclusive AI policies that address the unique challenges. Another benefit of public consultations is that next to gathering valuable input, it fosters trust.

Moreover, the Ministry of Internal Affairs needs to actively communicate with the European Union and other international bodies to stay informed about the latest developments and best practices in AI governance. By sharing insights and updates from these discussions with municipalities, the Ministry can help local governments better understand and address AI-related challenges. The Ministry must translate these broader discussions into practical guidance that municipalities can implement. This ensures that AI policies are both effective and aligned with international standards, supporting a fair and transparent approach to AI in public services.

6.3.2.2 VNG supporting central IT infrastructure

The VNG, as the central organ where municipal leaders gather, must reassess its role in supporting AI adoption across municipalities. Currently, the VNG often finds itself subordinate to the interests of larger municipalities, which can undermine its ability to advocate effectively for the needs of smaller and medium-sized municipalities. The smaller municipalities heavily depend on the VNG for essential AI infrastructure and support, yet the VNG's influence is often diminished by the dominance of larger municipalities.

To address these challenges, the VNG needs to adopt a more assertive stance in its leadership and advocacy roles. It should prioritize creating and managing centralized platforms and resources specifically designed to support the AI needs of all municipalities, regardless of size. By strengthening its authority and focusing on equitable resource distribution, the VNG can ensure that smaller and medium-sized municipalities receive the support they need to leverage AI technologies effectively. This shift will help reduce disparities in AI readiness and empower all municipalities to benefit from advancements in AI, fostering a more balanced and inclusive approach to AI adoption in the Dutch municipality landscape.

6.3.3 Implications for other organisations (theoretical insights)

As AI continues to reshape industries, organisations across various sectors have to deal with the challenges and opportunities associated with AI adoption. Beyond municipalities, other organisations face unique hurdles in aligning AI technologies with their strategic goals. This section explores how AI maturity models, supported by empirical research and qualitative insights, can serve as a strategic tool for organisations aiming to integrate AI into their operations. The discussion aims to provide insights for organisations to enhance their AI readiness and contribute to the broader theoretical understanding of AI adoption dynamics.

6.3.3.1 Utilizing AI maturity models for strategic AI adoption

AI maturity models are useful tools for helping organisations evaluate their readiness to adopt AI technologies. These models aid AI adoption by providing a structured framework for assessing existing capabilities. By categorizing AI relevant areas in which resources and capabilities are lacking, these models serve as a starting point for organisations to identify gaps and prioritize improvements. However, the real value of AI maturity models emerges when they are complemented by qualitative insights obtained through stakeholder interviews.

While AI maturity models offer a broad categorization of organisational readiness, they do not provide specific insights into what specific resources and capabilities need to be improved. Qualitative insights are essential for filling this gap, as they offer a nuanced understanding of the unique challenges and barriers organisations face in their AI adoption process. With the detailed, contextual understanding gained from qualitative interviews, organisations can tailor their AI adoption strategies more effectively to the unique context of the organisation, thereby enhancing the overall effectiveness of AI adoption efforts

6.3.3.2 Building a Culture of Continuous Learning and Adaptation

Utilizing AIMM allow organisations to regularly evaluate their progress across different dimensions, identifying areas for improvement and facilitating strategic decision-making. This ongoing assessment process also serves as a mechanism for organisational learning and adaptation, enabling businesses to respond effectively to new challenges and opportunities in AI adoption.

Literature advocates that an AI system mindset is essential to maintain competitiveness and avoid being outcompeted by more adaptive rivals (Ajay Agrawal et al., 2022). This requires fostering an environment that encourages experimentation, continuous learning, long-term thinking and collaboration across departments. By establishing a culture that supports AI initiatives, organisations can empower employees at all levels to engage with AI technologies, fostering innovation and driving the organisation's growth. Such a culture ensures that AI is not just an isolated initiative but a core component of the organisation's strategic vision, enabling it to harness the full potential of AI technologies effectively. Without this cultural shift, organisations risk falling behind as AI continues to transform industries, much like businesses that failed to adapt during the industrial revolution.

6.4 FUTURE RESEARCH

6.4.1.1 Developing Inclusive AI Models and Understanding Public Perception

Future research should focus on methodologies for developing fair and unbiased AI systems. Randomized sampling in external validation is one approach to reduce bias and enhance fairness (Ramspek et al., 2021; Steyerberg & Harrell, 2016) but can be hard due to required sample sizes (Riley et al., 2024). Transparency in AI models can be promoted through open-source initiatives and white-box models (Aporia, 2023). However, these approaches introduce risks, such as the potential misuse of models by individuals seeking to circumvent detection. Research could explore strategies to balance transparency with security, ensuring that open-source models are protected against malicious use while still being accessible for scrutiny.

Understanding public perception of AI in government decision-making is challenging due to the limited number of experts in AI and ethics (Brey & Dainow, 2023). Research in this area could explore innovative methods for engaging with the public and stakeholders to gauge their views on AI applications. Developing frameworks for assessing public opinion and ensuring it informs AI deployment will be crucial for aligning technologies with societal values.

6.4.1.2 The Role of Collaborations in AI Adoption

Another area for future research are collaborations, both within and beyond government entities, and how they impact AI adoption. Collaborations between municipalities and central government can facilitate resource and knowledge sharing (Hayes, 2024; Tauté, 2020), possibly improving AI adoption efficiency. Public-private partnerships are also significant, as they can drive innovation and model development (Di Sibio, 2022). However, municipalities and governments need to set clear requirements for these models to ensure they meet public sector needs. Investigating the dynamics of these collaborations and their effects on AI strategy can provide valuable insights into optimizing resource sharing and enhancing AI capabilities.

The case of Denmark, as mentioned in the results, highlights the potential benefits of central shared IT infrastructure (Vogelaar, 2024). Future studies could further investigate this model's success factors and applicability to other contexts. Understanding how centralized resources contribute to AI maturity and strategy development can help inform similar initiatives in other regions.

6.4.1.3 From Fragmented Resources to Organisational Capabilities

Understanding the process of acquiring and integrating AI capabilities remains an area with limited empirical research (Papagiannidis et al., 2021; Pinski et al., 2024). Future studies could explore methodologies for effectively acquiring resources and developing them into organisational capabilities. This research could provide insights into how organisations can manage and utilize AI resources to support their strategic goals. Papagiannidis' work on Resource Orchestration (RO) frameworks provides an example on this exploration (Papagiannidis et al., 2021). Further empirical studies could build on this framework or others to understand the processes involved in converting resources into strategic AI capabilities. Research could focus on practical applications of the RO framework and how organisations can systematically address gaps and enhance their AI capabilities.

6.4.1.4 Addressing Expertise Challenges in Machine Learning

While machine learning algorithms are powerful tools for analysing data and making predictions, they often require domain experts to ensure that the models interpret the data correctly and make meaningful predictions. A significant challenge in machine learning is the lack of individuals with high-level expertise in both domain knowledge and machine knowledge or collaborations between two experts (geeksforgeeks, 2024; Sundberg & Holmström, 2024).

Understanding how to bridge the knowledge gap between domain expertise and ML insights, is crucial for advancing effective ML strategies. Investigating methods for effectively merging these areas will be important for the successful development of ML applications. Research could investigate methods for overcoming this barrier, such as through targeted education programs or fostering collaborations between domain experts and AI specialists.

6.4.1.5 Conclusion

The future research opportunities outlined here highlight key areas for further investigation to enhance AI adoption and implementation in public organisations. By addressing these multiple different research areas, researchers can contribute to a generally more effective AI adoption of organisations and society as a whole.

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8 APPENDIX

8.1 MATURITY LEVELS (ALSHEIABNI ET AL., 2019)

Level 1 initial. Organisations associated with maturity level one - the capability exists but there is a lack of organisational knowledge. AI responsibilities are decentralised and have no dedicated unit for AI. It is essentially used by individual's function or team without the clear awareness of the organisation about the actual usage. Since there is a lack of organisational awareness about the usage, it cannot be sufficiently measured and control by the organisational IT. Therefore, there is no AI related governance or regular principles of operation which are extended to AI services by the users themselves.

Level 2 assessing. Here, the capability is well-developed and the organisation has decided to move towards AI - with some initial steps in that direction. The AI substructure is already functioning centrally and basic capabilities such as ad hoc analyses are provided. Organisation initial AI strategy; for each AI application, and defined a value proportion is one of the main drivers of AI adoption. However, decentralised solutions still exist and the organisation is faced with AI restrictions issues.

Level 3 determined. Based on the knowledge obtained in level 2, the organisation becomes more conscious of inherent risks and opportunities for AI. Organisations that achieve this level have an AI strategy focused on technology and tools. The organisation has standard operating procedures that cover AI scenarios; change management is introduced. The organisation also employs AI talent and resources are provided. This level has strong top management which influences the challenge of aligning the AI with organisational goals; IT capabilities can be addressed.

Level 4 managed. Organisation capability is very well developed. In terms of achieving the primary goal for this stage there is a well-defined value to support and full top management support. Regarding the data dimension, the increase of data regarding the source and structure.

Additionally, appropriate data science exists to make critical business decisions using AI Level 5 optimised organisations are at the final level of AI maturity. They are realising the full role; responsibilities and accountability are clearly defined within each AI project. Data structure is flexible and pro-active to achieve business impact. Altogether, the initial model will be discussed with the AI expert regarding the potential maturity level errors could be found.

8.2 EXPLANATION OF DIMENSIONS OF CUSTOM AI MATURITY FRAMEWORK

8.2.1 Management support

Management support relates to whether the organisation has allocated internal resources for AI initiatives and if managers stimulate AI adoption initiatives.

Quote [123]: "Yes, that's really a continuous challenge. That's why we also try to do things together with others as much as possible and use what we have smartly. Yes, it's like I said, you don't have unlimited resources, especially not when looking towards the future."

8.2.2 AI opportunity literacy

AI opportunity literacy relates to how well the organisation can identify valuable AI uses cases.

[37] "Well, I just notice on all fronts that they cannot communicate well with each other because, especially at the management level, they really don't have the knowledge to think together about what they could achieve with AI."

8.2.3 AI governance literacy

This dimension refers to the organisation's depth of ethical understanding and current knowledge regarding the risks associated with AI use.

[6] "Municipalities are currently figuring out what this new technology entails and which regulatory and ethical demands they have to adhere to."

[70] "Things like the IAMA reveal risks that you hadn't thought of before. It doesn't necessarily mean they'll stop using it, but it means they'll take it into account. Or, for example, if there's a bias, they can prevent it. So, I don't think many projects will be stopped because of me, but it's more about awareness and understanding what they are doing and that the person using the algorithm understands how it works, as there is often a discrepancy there."

8.2.4 Employee acceptance of AI

This has to do with the mindset of employees on AI adoption and their alignment with the organisation's AI adoption mindset.

[82] "One says, 'We need to apply AI and smart automation because we simply have an enormous staff shortage. We can't handle all the tasks that come to the municipality each year.' But there are also people, at a slightly lower level, who say, 'No, we don't want that automation in our team because it will affect my people, and I don't want to fire my people.' So, the staffing level is a bit of a mixed situation."

8.2.5 Experimentation culture

This dimension has to do with how free people are to experiment with AI and the organisation supporting this kind of culture.

[139] "But we do say, 'if you want to see how such a tool works or how to talk with such an Open AI app, try it out once, but not with municipal data or work-related things.''

[140] "So, we really say to do this in a safe environment, in short cycles, just to see if it works, if it's possible, and if it's accepted by certain employees or even residents. But then, we will really look very specifically at pilots and experiments."

8.2.6 Responsible AI governance processes

Responsible AI governance processes refer to the documentation and standardized process in the organisation that are aimed to support responsible AI development and use.

[48] "Well, within the government, you have the IAMA, the Impact Assessment Management and Algorithms, which is now mandatory. You really have to comply with it, and it includes all kinds of questions like who do you involve? Why? Which groups might be affected? Sometimes it's very difficult, right? For example, if you create a fraud detection system, do you then discuss it with fraudsters?"

[61] "We have an algorithm governance within the municipality, so it's not really about AI yet but about algorithms. I am responsible for implementing it, which includes maintaining the register, both the local and the national algorithm register, ensuring the right assessments are carried out at the right time."

8.2.7 AI maintenance

This dimension refers to whether the organisation has a proper understanding of the long-term implications of AI and its respective requirements such as continuous updates to reduce bias and proper accountability.

[52] "No, you constantly need to provide new data about what's happening in the real world. A model is a modeling of reality, and if reality changes, you have to keep up. So, you need to keep your data in order, as you will get changes in tasks/activities."

[51] "And furthermore, who will be responsible for it? You get organisational questions too. It's not just about setting up a model or a chatbot. Questions like, who will this fall under? Who will take care of maintenance?"…..

8.2.8 Data quality

Whether the organisation has processes to ensure the quality (accuracy, completeness) of data collected. And whether there is a single source of truth, and reliable meta data. Bias in data should be as low as possible.

[52] "No, you constantly need to provide new data about what's happening in the real world. A model is a modeling of reality, and if reality changes, you have to keep up. So, you need to keep your data in order, as you will get changes in tasks/activities."

[89] "We have a lot of data, so much data, and you can get access to a lot of data too. It's more about the ethics and what you use if that data isn't there. Of course, the data isn't really in order. No one has their data in order. I've never heard of an organisation that has its data in order. But the data is there, and you can make improvements in that."

8.2.9 Machine learning infrastructure

While, closely related and overlapping with the data infrastructure ML infrastructure serves different primary purposes.

[93] "What I notice very much is that the architects from the data, information, and technology department are really pushing for us to have an entire environment created where AI can fit in."

8.2.10 Data infrastructure

AI data infrastructure encompasses the hardware and software systems that collect, store, manage, and analyse vast amounts of data, ensuring the data is accessible and usable for AI applications.

[170] "So far, we only have relational databases, no logical ones or data lakes, so that makes it much harder to do anything technical. So, we still need to work on that. The infrastructure is not yet in order."

8.2.11 Strategy development and communication

The strategy dimension consists of everything that has to do with the continuous strategy process, from defining successful AI adoption to the communication of this strategy to the stakeholders of AI adoption.

[75] "Ultimately, we really follow the Ministry of the Interior here, so when they or the Association of Dutch Municipalities (VNG) come up with a strategy, we follow it. We don't really believe that every municipality should write its own separate policy on this because that simply won't work. Otherwise, you'll have one municipality fully running on AI and another still doing everything on paper, to put it extremely."

[182] "So the questions are coming, but it's no longer about using AI in a good way, but more about how we can properly document ethics so that we can account for what we're doing."

8.3 CODING OF EXPLORATORY INTERVIEWEES

8.3.1 Interviewee A1 and A2

8.3.1.1 Findings categorized in dimensions

Management support

[1] There is enough funding from the ministry of internal affairs and ministry of economic affairs.

[2] There are collaborations between central government, municipalities and other organisations to enhance AI adoption resources.

AI opportunity literacy

N.A.

Strategy development and communication

[3] The interviewees categorized strategies based on the inclination to adopt AI. In Everett Rogers' model this would be innovators, early adopters, early majority, late majority, and laggards (Sahin, 2006).

[4] A waiting for others strategy was needed for municipalities that knew about the opportunities of the new technologies, wanted to adopt them, but decided not to because of resource/skills issues.

Employee acceptance of AI

[5] More than 1500 processes and people she met were not afraid to lose their jobs. There is not enough workforce available right now and they want to have more direct contact with citizens to improve their service.

Experimentation culture

N.A.

Responsible AI governance processes

N.A.

AI governance literacy

[6] Municipalities are currently figuring out what this new technology entails and which regulatory and ethical demands they have to adhere to.

[7] A lot of municipalities don’t build AI themselves and use external experts to educate themselves on AI governance literacy.

AI maintenance

[8] Municipalities don’t even know where some of their algorithms or AI applications are used.

Data quality

N.A.

Data infrastructure

N.A.

Machine learning infrastructure

N.A.

Other

[9] The interviewee explained that municipalities don't see algorithm adoption as a new point on the agenda by its own. Algorithms and AI are complementary technologies for digitalization.

[10] She said ''stay away from public domain because of all the ethical and regulatory rules''

8.3.1.2 Information on sub-questions

SQ 1: Will municipalities' AI strategies aim for a defined subjective adoption ''success''?

SQ 2: Is the negative public perception stemming from past AI cases significantly influencing the subjective interpretation of successful AI adoption and therefore municipalities' AI strategies?

SQ 3: Is the subjective interpretation of 'successful' AI adoption influenced by the perceived current level of resources and capabilities?

[4] A waiting for others strategy was needed for municipalities that knew about the opportunities of the new technologies, wanted to adopt them, but decided not to because of resource/skills issues.

SQ 4: Is the culture unsupportive of experimentation with AI due to fears that past AI failures might recur?

[10] The interviewee advised me to stay away from the social domain, because of the discrimination and regulation debates going on over there.

SQ 5: Do municipalities use traditional and rigid management structures that slow down AI adoption?

8.4 Coding other interviews (translated from Dutch to English via ChatGPT GPT-4o mini)

8.4.1 Interviewee B1

8.4.1.1 Quotes categorized in AI readiness dimensions

Management support

[11] "Yes, especially in smaller municipalities and even in larger ones, a lot of knowledge is outsourced. So, I sometimes doubt whether they really have the expertise, but then it's just outsourced a lot, and there are budgets to do that, right?"

[12] "Yes. Look, the average municipality is not going to do programming unless you're Amsterdam or Rotterdam. For example, in Breda, they know very well how to manage projects. They know they need to hire skills, provide data, and be very critical of domain knowledge because it's very important. They know all this and it goes pretty well."

AI opportunity literacy

[13] "A lot of governments struggle with the question of how to start with AI. And thirdly, which is actually the main focus, I give a lot of lectures. Over the past six months, around a hundred or so, so that's really the bulk of my time."

[14] "People are actually initially unconsciously incompetent, right? And after I've given a lecture, they become consciously incompetent. They suddenly realize what the topic is and then they find out they actually know nothing."

[15] "Yes, well, it's often just one or two people who are very enthusiastic who try to drag the rest along. Often, they can't even get the rest on board themselves and then hire an external consultant to say that. You understand?"

[16] "Well, I just see from all sides that they can't communicate well with each other because, especially at the executive level, they really don't have the knowledge to think together about what they could achieve with AI."

[17] "The big problem is still knowledge. People actually don't know how to use AI and for what purposes."

Strategy development and communication

[18] "The Ministry of the Interior (BZK) has written a very good vision on generative AI, but they mainly explain that it's important to start and keep it small at first and follow a learning approach, so that's actually a good document."

[19] "Correct, yes, that has to be found internally. Yes, yes, yes. And there is still nothing overarching. There is no overarching organization that says, 'Come together, municipalities, and we'll figure it out together!' Yes, that should be done by the VNG, but they don't do it."

[20] "One of my suggestions for municipalities is to hire that knowledge because you don't have the time to keep up with it. If necessary, hire a consultant who comes by once a week to discuss and brainstorm, and inspire people, because then the development process will get moving."

Employee acceptance of AI

[21] "And the people who often cause the most trouble are the Data Protection Officers (FGs) and the Chief Information Security Officers (CISOs)? They are immediately negative about everything."

[22] "Yes, there is also a large group who think it will blow over. It's a bit like blockchain, you know? That was also the case 5 or 6 years ago, and they think, well, that will blow over too and then we can just go back to what we were doing before."

[23] "For example, many governments make a model, and you should know that 95% of all models never go into production! And that's because everyone thinks, 'Oh, we'll make a nice model and then it needs to be put into production,' and then they don't know how to do that because you need some kind of interface to the end user."

[24] "They are often anxious; they find it scary, yes, and the old saying 'unknown makes unloved' applies here. So there is also real resistance. There are also studies that show that especially older people have a fear of AI. Because they don't understand what it does and are afraid it will affect their jobs."

Experimentation culture

[25] "There are a few municipalities that are actually already very professional in this area. For example, the municipality of Breda has an innovation fund, and they also say, 'Well, if 30% of the projects fail, that's acceptable.' And they know that these kinds of projects need to be approached very interactively."

Responsible AI governance processes

AI governance literacy

[26] "I think the biggest barrier is often the fear of legislation. Fear of GDPR, fear of the AI Act, afraid that the image of your organization will suffer or that you'll be disgraced. There are also quite a few advantages. I think it's especially in the management and the executives who are afraid of failure. And yes, that's also related to a lack of knowledge."

AI maintenance

[27] "Yes, monitoring the output is of course a very important part, you have to keep testing constantly. This is also called model drift or data drift."

Data quality

N.A.

Data infrastructure

[28] "They think quite short-term, so they say, 'Okay, what is the business case for this specific AI?' And on the cost side, certain infrastructure or databases come into play. But in the long run, it will become easier to use that database you already have or that infrastructure you already have to build new algorithms."

[30] "So they have the IT environment and they have the data. So that's not a problem. They often have the computing power and sometimes even data warehouses. You often see that they are already quite good in terms of data. What municipalities often do very well is creating dashboards."

Machine learning infrastructure

[28] "They think quite short-term, so they say, 'Okay, what is the business case for this specific AI?' And on the cost side, certain infrastructure or databases come into play. But in the long run, it will become easier to use that database you already have or that infrastructure you already have to build new algorithms."

Other

[32] "Well, I think the most potential now lies in generative AI, right? So the use of ChatGPT and other generative applications. To automate very simple tasks. For example, rewriting letters from one language level to another for low-literate people, or transcribing audio files from kitchen table conversations into text. Or writing minutes quickly and neatly or searching texts which can be accelerated by a chatbot. Those kinds of applications are the most interesting."

[33] "Yes, yes. Well, yes. It is true that AI changes so quickly that it is difficult for an average person to keep up with everything."

[34] "Yes, what you also see is that the AI law is fairly reasonable, but at the same time, it hinders innovative power. And while it is being written, the reality is changing, so it is always a bit behind the technical reality."

8.4.1.2 Quotes about sub-questions

SQ 1: Will municipalities' AI strategies aim for a defined subjective adoption ''success''?

SQ 2: Is the negative public perception stemming from past AI cases significantly influencing the subjective interpretation of successful AI adoption and therefore municipalities' AI strategies?

[35] "I think the biggest barrier is often the fear of legislation. Fear of GDPR, fear of the AI Act, afraid that the image of your organization will suffer or that you'll be disgraced. There are also quite a few advantages. I think it's especially in the management and the executives who are afraid of failure. And yes, that's also related to a lack of knowledge."

SQ 3: Is the subjective interpretation of 'successful' AI adoption influenced by the perceived current level of resources and capabilities?

[36] "Well, the municipalities that are leading are really the larger municipalities in the Netherlands, like The Hague, Amsterdam, Rotterdam, Utrecht, Eindhoven, Den Bosch, Breda. You know, they also have really professional data clubs or AI clubs, and there is development, and it almost seems to be related to the size of the municipality. If a municipality is below a certain number of inhabitants, they don't have enough money or time to seriously tackle it, so to speak."

[37] "Well, I see from all sides that they can't communicate well with each other because, especially at the executive level, they really don't have the knowledge to think together about what they could achieve with AI."

SQ 4: Is the culture unsupportive of experimentation with AI due to fears that past AI failures might recur?

[39] "But yes, there is also some baggage since the childcare benefits scandal." (Talking about the ease of developing different kinds of AI applications)

SQ 5: Do municipalities use traditional and rigid management structures that slow down AI adoption?

[38] "And they know that these kinds of projects need to be approached very interactively, right? So methods like agile and terms like scrum and sprint work really well. But there are also municipalities that are still stuck in the old waterfall model. And they think they need to completely investigate something, regulate everything, set money aside, maybe even have it go through the city council. Yes, and those are really the wrong strategies, so there are indeed problems there."

8.4.2 Interviewee B2

8.4.2.1 Quotes categorized in AI readiness dimensions

Management support

[40] "But they can also do that more easily. You also have municipalities that offer services to other municipalities, right? So they actually handle IT for multiple municipalities."

[41] "Well, that's a good question. Look, the nice thing is we have a national AI course. It also has a government-specific training, which would be a really nice step. You know, if you start there, you also get to see practical cases."

AI opportunity literacy

[42] "You sort of have a solution, and then a problem is conceived rather than the other way around. You should be thinking about how we can ultimately improve the municipality? Better support and help the citizens, and what technology would you need for that? But it's often done the other way around."

[43] "That is of course also logical because if you don't know what is available, you can only reason with something you do know. So what's often done too little is asking for help. For example, discussing a few things with us and finding out what would be the most valuable and how technology could support that."

[44] "Especially with generative AI, what you have is that what they call the operational costs, the running costs, are quite difficult to estimate. So I think many underestimate that."

[45] "Yes, first of all, we talked about the media, right? So if you hear about everything that can be done, you want it yourself. Additionally, you also have big tech, right? For example, if you have a municipality and your IT is on Microsoft, Microsoft pushes this technology tremendously."

[46] "Also, the lack of expertise, right? Because it's quite different from buying a software product off the shelf. You need more expertise yourself."

[47] "Because you actually need knowledge to accurately assess the opportunities, risks, and threats of certain algorithms. Only then can you make a well-considered decision on whether to proceed and in what form."

Strategy development and communication

Employee acceptance of AI

Experimentation culture

Responsible AI governance processes

[48] "Well, within the government, you have the IAMA, which is now mandatory—the Impact Assessment Management and Algorithms. You really have to comply with that, and it includes all these kinds of questions. Questions like who do you involve? Why? Who might be affected? Sometimes it's also very challenging, right? For instance, if you create a fraud detection system, would you discuss it with fraudsters?"

[49] "Yes, it is mandatory for governments. If you develop an algorithm or a model now, you must go through the IAMA."

AI governance literacy

AI maintenance

[50] "So there is naturally a lot of thinking that, yes, you build such a system, and it's smart and learns on its own, so you put it into production and then you don't need to worry about it anymore. And that's the last thing that happens because as soon as you have it in production, that's actually when your work begins."

[51] "And further, who will be responsible for it? So you also get organizational questions. It's not just about setting up a model or a chatbot. Questions like under whom will this fall? Who ensures maintenance? Who manages change in your organization? The work of people can change. And who is responsible for guiding that?"

[52] "No, you must constantly provide new data on what happens in the real world. A model is a representation of reality, and as reality changes, you have to adapt. So you need to keep your data in order; you get changes in tasks/work activities."

Data quality

[52] "No, you must constantly provide new data on what happens in the real world. A model is a representation of reality, and as reality changes, you have to adapt. So you need to keep your data in order; you get changes in tasks/work activities."

Data infrastructure

Machine learning infrastructure

Other

[53] "The childcare benefits scandal, yes. I think the childcare benefits scandal was discriminatory from the very beginning. The decision was already discriminatory, so the algorithm merely followed it."

[54] "And lastly, you also have the pressure from aging, right? There are simply shortages in the market everywhere. This also applies to municipalities, so you either have to keep doing the same with the same or fewer people, or you might even have to do more with fewer people. And there are very few technologies that can increase the productivity of your employees. So the pressure from aging, demographic incentives is also significant."

8.4.2.2 Quotes about sub-questions

SQ 1: Will municipalities' AI strategies aim for a defined subjective adoption ''success''?

SQ 2: Is the negative public perception stemming from past AI cases significantly influencing the subjective interpretation of successful AI adoption and therefore municipalities' AI strategies?

[55] "Well. One of the barriers is also fear of technology, right? And that's often unfounded fear. The barrier is also again the horror stories from the media. So you mentioned the childcare benefits scandal, you had Rotterdam where everything went wrong, and that makes people not always have enough trust to start this."

SQ 3: Is the subjective interpretation of 'successful' AI adoption influenced by the perceived current level of resources and capabilities?

[56] "Well, I think you mainly see that these are quite costly projects. So municipalities that engage in this are primarily those with a larger budget, right?"

SQ 4: Is the culture unsupportive of experimentation with AI due to fears that past AI failures might recur?

[55] "Well. One of the barriers is also fear of technology, right? And that's often unfounded fear. The barrier is also again the horror stories from the media. So you mentioned the childcare benefits scandal,

you had Rotterdam where everything went wrong, and that makes people not always have enough trust to start this."

8.4.3 Interviewee C1

8.4.3.1 Quotes categorized in AI readiness dimensions

Management support

[56] "Well, I think that the team, at least the analytics team we have, is very good at what they do. And yes, for me, that's mainly about sharing information with other agencies and also being able to clearly say, 'We can't do this,' or 'This doesn't work,' or 'This isn't functional.'"

[57] "I think the municipality has the right people for that? Yes, resources? There are always more people needed. There is always a shortage. It's always busy. So of course, in terms of resources, we are mainly focused on the human aspect now."

AI opportunity literacy

Strategy development and communication

[58] "We are currently in a bit of a tricky moment because we are updating the governance. We do have rules in place, which means we've looked at the BZK guidelines to at least be able to inform employees. For example, we understand you want to use this, but make sure to pay attention to this, this, and this."

[59] "If we are using it, it's mainly done in the pilot phase within the analytics team. That's the team that builds the algorithms, so they actually understand what's happening. I think that's now the biggest part of the strategy. Ultimately, we really follow BZK on this; when they come up with a strategy or the VNG, we will follow because we don't really believe that every municipality should write its own separate policy on this. That wouldn't work either because then you'd end up with one municipality fully implementing AI and another doing everything on paper, to put it extremely."

[60] "So, yes, it sounds almost a bit ethereal, but I would say what you especially don't need is people with an ego because you work for the citizen. If the algorithm doesn't do what it should for the citizen, then you don't use it."

[75] "Ultimately, we really follow BZK on this; when they come up with a strategy or the VNG, we will follow because we don't really believe that every municipality should write its own separate policy on this. That wouldn't work either because then you'd end up with one municipality fully implementing AI and another doing everything on paper, to put it extremely."

Employee acceptance of AI

Experimentation culture

Responsible AI governance processes

[61] "We have algorithm governance within the municipality, so it's not yet about AI but really about algorithms. I am responsible for its implementation, which includes maintaining the register. So, the algorithm register, both XXX and the national one, and ensuring that the right assessments are conducted at the right times."

[62] "We already register what's needed; we follow BZK on this. The only thing we still really need to look at is the piece on prohibited applications. For now, we assume we don't use that since we haven't seen it come up yet."

[63] "Yes, they have indeed just changed it. It used to be high and low risk, and now it’s impactful and other, and high-risk AI systems."

[64] "There’s an AI governance framework, and we are also working on updating it because it’s now a year old, and with this technology, that’s quite old."

[65] "Well, I can only speak for my discipline, but we have developed a tool within the municipality, the Algorithm Risk Assessments (ARA), which consists of three parts."

[66] "Is it really so? Then the risk level is assessed. For now, we use only high and low risk, but we register both."

[67] "If it’s high risk, we will conduct an IAMA, so an impact assessment on human rights and algorithms. For low risk with ethical dilemmas, we do a data ethics assistant, and if there are no ethical risks, we just register."

[68] "Issues like the IAMA are where risks may be identified that you hadn’t considered. This doesn’t necessarily mean they will stop it, but it means that, well, they take it into account. For instance, if there is bias or not, they can prevent it. So I don’t think many projects will actually be stopped from my end, but it’s more about awareness and ensuring that people understand what they are doing and that those using the algorithm also understand how it works, because that’s where discrepancies often occur."

[69] "At the beginning, there was a bit of a reaction like, 'Oh, do we have extra paperwork again and need to jump through more hoops?' Which is quite logical because it is quite a bit. However, I’ve noticed that recently this has been decreasing. People understand it, and especially now that the AI Act is getting more news coverage, people realize what we are doing."

AI governance literacy

[70] "Issues like the IAMA are where risks may be identified that you hadn’t considered. This doesn’t necessarily mean they will stop it, but it means that, well, they take it into account. For instance, if there is bias or not, they can prevent it. So I don’t think many projects will actually be stopped from my end, but it’s more about awareness and ensuring that people understand what they are doing and that those using the algorithm also understand how it works, because that’s where discrepancies often occur."

[69] "At the beginning, there was a bit of a reaction like, 'Oh, do we have extra paperwork again and need to jump through more hoops?' Which is quite logical because it is quite a bit. However, I’ve noticed that recently this has been decreasing. People understand it, and especially now that the AI Act is getting more news coverage, people realize what we are doing."

[71] "But we all notice that now that the AI Act is in place, there is less resistance."

AI maintenance

[72] "We also want to implement something like this. On one hand, it’s almost an administrative task, meaning that an email comes to the process owner saying, 'Hey, have you done this yet?' And if something is done or not done, then, well, that’s okay. But as I mentioned, my role is really more advisory, so it can also happen that the process owner says, 'I’m not going to do this.' And that’s then their choice."

Data quality

Data infrastructure

Machine learning infrastructure

Other

[73] "If I see something happening here that I think isn't right or that I think there's bias in, or, well, things don't add up, I point that out. But it's up to the process owner to make a decision on that."

[74] "Well, I think the most important thing for us now is capacity. We want a lot, we can do a lot, but in terms of people, not so much."

8.4.3.2 Quotes about sub-questions

SQ 1: Will municipalities' AI strategies aim for a defined subjective adoption ''success''?

[76] "But if for some reason they find out that it doesn't work or if there is development from outside saying, 'This is not desirable,' then we also just stop it. But the real strategy will mainly come within the governance."

[79] "So, yes, it sounds almost a bit ethereal, but I would say what you especially don't need is people with an ego because you work for the citizen. If the algorithm doesn't do what it should for the citizen, then you don't use it."

SQ 2: Is the negative public perception stemming from past AI cases significantly influencing the subjective interpretation of successful AI adoption and therefore municipalities' AI strategies?

[76] "But if for some reason they find out that it doesn't work or if there is development from outside saying, 'This is not desirable,' then we also just stop it. But the real strategy will mainly come within the governance."

[77] "But what you do notice is that the city council in Rotterdam is, quite logically, also quite critical of algorithm use."

[78] "Two years ago, there was a case XXXXX that you probably saw come up. Well, it turned out that a municipality's algorithm was discriminatory and was then stopped. And the effects of that are still felt. And my role also came out of that, to actually prevent that from happening. ... And I think politics, as I said, logically, has become somewhat more critical of that."

SQ 3: Is the subjective interpretation of 'successful' AI adoption influenced by the perceived current level of resources and capabilities?

SQ 4: Is the culture unsupportive of experimentation with AI due to fears that past AI failures might recur?

[80] "Now we are a bit more cautious about it because, yes, the implications of that are hard to foresee, so we are really very reserved."

[76] "But if for some reason they find out that it doesn't work or if there is development from outside saying, 'This is not desirable,' then we also just stop it. But the real strategy will mainly come within the governance."

SQ 5: Do municipalities use traditional and rigid management structures that slow down AI adoption?

8.4.4 Interviewee D1

8.4.4.1 Quotes categorized in AI readiness dimensions

Management support

[77] "The reason for that is if they hadn't said so, they would receive a lot of pushback from higher-ups about simply running AI pilots. They prefer to quickly investigate what has added value. Therefore,

they chose to dismantle it rather than entering a long tunnel where many people need to give their opinions and tick boxes."

AI opportunity literacy

Strategy development and communication

[78] "Let's see what we run into, and around that we form the policy and strategy, and that just comes out. But it is also very logical; from another perspective, they say it shouldn't be done and that they want to have an idea of how the architecture is set up before starting something like that. So I think from each municipality you interview, and from each different angle, you would get a completely different idea."

[79] "Do you happen to know the reasons why they might oppose? ... Yes, fear of the unknown and conducting such trials. Often, things go like, 'Oh, it's a pilot and now it's gone into production.' You know, that line becomes quite thin. By strictly saying they will dismantle it, they ensure that it will not go into production."

[80] "Yes, higher-ups have not yet laid down any firm policies and would rather keep things as they are than actively take action. It's somewhat like, 'AI is passing us by, or we'll wait until there is more clarity and then we'll be a sort of smart follower.'"

[81] "Probably, it will be medium-sized municipalities, and the Big Four will not participate. So, an overview of what you have in your organization in that area and what we can use, borrow, or take over from each other. An example is the WOZ process we talked about earlier; we were able to use the code from the municipality of Leeuwarden, which allowed us to build what we have much faster."

Employee acceptance of AI

[82] "On one side, there are those who say we need to apply AI and smart automation because we have such a huge personnel shortage. We cannot handle all the tasks that come to the municipality every year. We just can't manage. But there are also people, and this is at a lower level, who say they don't want automation in their team because it affects my people, and I don't want to lay off my people. So, the personnel issue goes both ways."

[83] "At the managerial level, people see many opportunities and are eager to use their employees more in customer contact and service areas. They see the value of AI in reducing administrative work for their employees, so they can focus more on customer contact. That is something they have a strong need for."

Experimentation culture

[84] "Exactly. And the AI part we're getting now, machine learning AI, is still in a different phase and methodology. It's about creating a POC first and seeing if it adds value."

[85] "What is happening now with AI is the policy on architecture from the AI lab where XXXX is located. They have stated that the POCs we do, a handful, will never go into production. That has already been agreed upon. The POCs will be dismantled and not preserved, and only the learning experience will be taken along."

Responsible AI governance processes

[86] "The reason for that is if they hadn't said so, they would receive a lot of pushback from higher-ups about simply running AI pilots. They prefer to quickly investigate what has added value. Therefore, they chose to dismantle it rather than entering a long tunnel where many people need to give their opinions and tick boxes."

AI governance literacy

[87] "It’s a matter of ignorance and therefore fear that they lack control and something might happen to citizens. And of course, you work here because you want the best for the citizen, and you’re really afraid, especially for the vulnerable group, in case something happens."

AI maintenance

[88] "Plus, processes are also Agile. It continues to change, so what is the case now does not mean that such a tool can keep working in that way. There is annual policy change, the world around us changes, processes change, so you are continuously improving and changing your tools. So, it’s very important to stay as close as possible."

Data quality

[89] "We have a lot of data; there is so much data and you can also access a lot of data. It’s more about the ethics and what you use, not whether the data exists. Of course, the data is not really in order; no one has their data in order. I’ve never heard of an organization that has its data in order. But the data is there, and improvements can be made."

Data infrastructure

[90] "We do indeed involve application managers, but we should involve architects more; currently, we don’t do that well. But in principle, you involve everyone from ICT who is needed, as long as the business agrees, i.e., if they say they will make these improvements."

[91] "Yes, there is money in the municipality, but the IT infrastructure still needs some work."

[92] "Ultimately, you want common ground, and that’s a very nice idea, but it feels a bit like a utopia. Because then you need to have the same applications, for example. And if you do that, there comes a monopoly of these system managers who then sit back because they have all the municipalities and no longer have incentives to innovate their systems and applications. So, the common ground principle is nice on one hand, but on the other hand, it doesn’t always work like that."

Machine learning infrastructure

[93] "What I really notice is that from architects and the data, information, and technology departments, there is a strong push to create an environment where AI can fit."

Other

[94] "And I think that is always a kind of struggle because one side, the business wants something faster than a policy is written. And that comes from both sides, I think. Within our municipality, that is at least the case from both sides."

[95] "And this process maps out the improvements we can make. Then the action follows. The improvement proposal goes to the business, and it’s up to the business to decide what to do with it."

[96] "There is not yet an overarching vision on this, and there will still be many discussions before we have clarity."

[97] "No, but I don’t really see it as a feeling. It needs to be substantiated; we need to be able to say we deliver improved customer value because our application processing time goes from 10 weeks to two weeks. So, that’s the added value, and then you compare that with the cost of €20,000 per year. Are we willing to pay that? It’s about substantiating that."

[98] "The municipality is really very cumbersome. To achieve something in municipalities, it takes a long time, etc. When working with other municipalities or organizations, it’s even slower. Often, if

something is there, I prefer to keep it as small as possible. That's my personal preference. The fewer other organizations involved, the better."

[81] "Probably, it will be medium-sized municipalities, and the Big Four will not participate. So, an overview of what you have in your organization in that area and what we can use, borrow, or take over from each other. An example is the WOZ process we talked about earlier; we were able to use the code from the municipality of Leeuwarden, which allowed us to build what we have much faster."

[92] "Ultimately, you want common ground, and that's a very nice idea, but it feels a bit like a utopia. Because then you need to have the same applications, for example. And if you do that, there comes a monopoly of these system managers who then sit back because they have all the municipalities and no longer have incentives to innovate their systems and applications. So, the common ground principle is nice on one hand, but on the other hand, it doesn't always work like that."

[99] "Okay, so you're only doing the technical side, like; you say this is going wrong or you monitor that this happens, and we need to update it? ... Yes, that's correct. And we send that out to the business. The business needs to indicate what happened here. Is it something we need to intervene in? Do we not need to intervene? They are also involved in those processes. They know what is really going on. And they need to come back to us. We call them the key users."

8.4.4.2 Quotes about sub-questions

SQ 1: Will municipalities' AI strategies aim for a defined subjective adoption ''success''?

[103] "Let's see what we run into, and around that, we form the policy and strategy, and that just comes out. But it is also very logical; from another perspective, they say it shouldn't be done and that they want to have an idea of how the architecture is set up before starting something like that. So I think from each municipality you interview, and from each different angle, you would get a completely different idea."

[104] "Yes, among other things, we have five pillars for that. I'll show you later. It's partly about sustainability, partly about ethics—five pillars you must meet. They need to be well-described, and during the POC phase, the project must already meet them; otherwise, it won't go into production. Then, we see if it can create added value, and if so, we would move to production. The reality is that we haven't done that yet."

[105] "Yes, I think, but I think it's also clear to you that AI should never be the goal; it should always be a means. I think that's the most important thing."

SQ 2: Is the negative public perception stemming from past AI cases significantly influencing the subjective interpretation of successful AI adoption and therefore municipalities' AI strategies?

[87] "It's a matter of ignorance and therefore fear that they lack control and something might happen to citizens. And of course, you work here because you want the best for the citizen, and you're really afraid, especially for the vulnerable group, in case something happens."

[100] "Of course, the fear of being nailed to the pillory plays a part. We want to regain that trust from the citizen, so it's better to avoid risks and ensure we restore that trust."

SQ 3: Is the subjective interpretation of 'successful' AI adoption influenced by the perceived current level of resources and capabilities?

[101] "Yes, that's not there yet. So, that's more my view. Ultimately, you could even reach level 5, but they're not ready for that yet. If you look at what you're saying, it's about resources."

[102] "So, I don't think it's about data. The issue is resources. When it comes to people, I think there are people here who really want and can contribute. And I think you also need to consider what your

vision is. Do you want to phase things out? And outsource parts through consultancy companies; that's what you want. You want to outsource pieces."

[81] "Probably, it will be medium-sized municipalities, and the Big Four will not participate. So, an overview of what you have in your organization in that area and what we can use, borrow, or take over from each other. An example is the WOZ process we talked about earlier; we were able to use the code from the municipality of Leeuwarden, which allowed us to build what we have much faster."

SQ 4: Is the culture unsupportive of experimentation with AI due to fears that past AI failures might recur?

[107] "So, those kinds of things play into it; generative AI is a big thing for KCC, customer contact. For example, invoice processing—there's a lot of intelligent document processing going on right now. So, how can we process invoices better? You notice from many sides that everyone thinks, 'Hey, interesting.'"

[79] "Do you happen to know the reasons why they might oppose? ... Yes, fear of the unknown and conducting such trials. Often, things go like, 'Oh, it's a pilot and now it's gone into production.' You know, that line becomes quite thin. By strictly saying they will dismantle it, they ensure that it will not go into production."

SQ 5: Do municipalities use traditional and rigid management structures that slow down AI adoption?

[106] "For RPA and automation, we are so accustomed that we no longer do POCs. We know it works; we do it in a waterfall manner. We create a minimum viable product, test it thoroughly, and wait for business approval. After testing, we go live... So because you already have experience and know how it works, you now have a waterfall structure, and it's easier to build the same thing? ... Exactly. And the AI part we're getting now, machine learning AI, is still in a different phase and methodology. It's about creating a POC first and seeing if it adds value."

8.4.5 Interviewee E1

8.4.5.1 Quotes categorized in AI maturity dimensions

Management support

[108] "Every now and then, we have a speaker who comes to talk about innovation or AI. I always try to be present for those talks."

AI opportunity literacy

[109] "So you have gained knowledge about... Yes, she says, you could, for example, scan signatures, so you know, hey, this is something we could actually do. How do you get this information about what you can do? Is it just from society, or is it also from within the municipality? ... Yes, it's a bit of both. I find it interesting myself, so I also follow certain accounts on Instagram or YouTube where various examples are presented."

[110] "Within the team I'm in, the XXXX group, there's also someone who is working on innovations related to YYYYY, the application we use, and particularly the AI tools within it. So, from that side, I also get some insights. And yes, every now and then, there's a speaker who comes to talk about innovation or AI, and I always try to be present."

Strategy development and communication

[111] "I always have the impression that municipalities have certain plans, but to make them really concrete and to get the organization on board, there is still room for improvement."

[112] "They are also working on developing a sort of employee DNA within the organization, focusing on service and the broader perspective of what is best for the citizen, the city, and the organization. It's not just about personal preferences or tasks that one enjoys; it's about looking at the bigger picture. That's a challenging cultural shift."

[113] "Yes, the new tool will be the focus for the coming years. I would like to see it become a bit more concrete and also understand precisely where it will be applied, which major business processes it will impact, and how the saved time will be used. Will people need to reskill, will the work need to be restructured, or will it result in job losses?"

Employee acceptance of AI

[114] "You now have certain team managers who are very eager and interested in innovation and process improvement. But you also have managers who are hesitant and concerned that AI might cost employees their jobs. There are significant differences at the team level."

[115] "Yes, and also some employees who think about their own positions. They might think, 'I shouldn't say too much because they might take my job.'"

[116] "We've encountered processes where we see opportunities for smart automation, but a manager might say, 'I want it, but it will cost my employees their jobs, so let's not do it.'"

[117] "We are currently working with managers who are supportive of AI, but when we try to use data-driven approaches, sometimes they are dismissed. It's nice to have support to get everyone on board."

Experimentation culture

[118] "Ideally, employees would spend 10% of their time improving processes. If you can do this with your entire team, you could make significant progress. They should look at the bigger picture, focusing on what's best for the city, the organization, and the residents, rather than just what's best for their team or their role."

Responsible AI governance processes

AI governance literacy

AI maintenance

Data quality

Data infrastructure

Machine learning infrastructure

Other

[119] "Now, there is a broader focus on customer value. It doesn't necessarily have to save money, but for example, the quality might improve, or the waiting time for a customer might decrease. For instance, an employee no longer has to perform certain tasks but has more time to call a citizen, visit them, or invite them."

[120] "What I personally encounter is that the business often has too little time to handle improvements alongside their regular work. The workload is already high, and they need sufficient time and energy to focus on improvements. This sometimes leads to delays in achieving real improvements."

8.4.5.2 Quotes about sub-questions

SQ 1: Will municipalities' AI strategies aim for a defined subjective adoption ''success''?

[111] "I always have the impression that municipalities have certain plans, but to make them really concrete and to get the organization on board, there is still room for improvement."

SQ 2: Is the negative public perception stemming from past AI cases significantly influencing the subjective interpretation of successful AI adoption and therefore municipalities' AI strategies?

SQ 3: Is the subjective interpretation of 'successful' AI adoption influenced by the perceived current level of resources and capabilities?

[113] "Yes, the new tool will be the focus for the coming years. I would like to see it become a bit more concrete and also understand precisely where it will be applied, which major business processes it will impact, and how the saved time will be used. Will people need to reskill, will the work need to be restructured, or will it result in job losses?"

SQ 4: Is the culture unsupportive of experimentation with AI due to fears that past AI failures might recur?

[117] "We are currently working with managers who are supportive of AI, but when we try to use data-driven approaches, sometimes they are dismissed. It's nice to have support to get everyone on board."

SQ 5: Do municipalities use traditional and rigid management structures that slow down AI adoption?

[120] "What I personally encounter is that the business often has too little time to handle improvements alongside their regular work. The workload is already high, and they need sufficient time and energy to focus on improvements. This sometimes leads to delays in achieving real improvements."

8.4.6 Interviewee F1

8.4.6.1 Quotes categorized in AI maturity dimensions

Management Support

[121] "Then we said we first need to develop more knowledge about it. So, we invited some people to give lectures. We are also going to organize sessions within the organization, broadly speaking, what is it, what can it do? What should you do with it and what do we actually not want as an organization? We said, well, knowledge building... It's going so fast, right? So I really notice that, it's going so fast, there's almost no knowledge that can keep up, so to speak."

[122] "Absolutely detailed, so for example, those kinds of knowledge sessions are what we are currently scheduling and working out."

[123] "Yes, that's a real ongoing challenge. And that's why we also try to do things as much as possible together with others and in a smart way. As a municipality, you don't have unlimited resources, especially not looking into the future."

AI Opportunity Literacy

[121] "Then we said we first need to develop more knowledge about it. So, we invited some people to give lectures. We are also going to organize sessions within the organization, broadly speaking, what is it, what can it do? What should you do with it and what do we actually not want as an organization? We said, well, knowledge building... It's going so fast, right? So I really notice that, it's going so fast, there's almost no knowledge that can keep up, so to speak."

[124] "We are also looking at whether we can do this in a controlled manner, in groups of people or at work, with a sort of digibuddy, which we call key users."

[125] "We are also working together with other municipalities. We are indeed trying to align by following the development of use cases, for example in Brabant, but also nationally. So, we haven't structured it very well yet, a bit ad hoc through connections."

Strategy Development and Communication

[126] "Then we had something like, well, if this comes, yes, you can ban it, right? That discussion is also ongoing, should you want all of this? But yes, you can ban a lot, but if it really works very well, then you've banned it for a year, but people will probably still use it somewhere else secretly."

[127] "So we started working on an approach where we say, well, how are we going to do this, and chatGPT is one of them, but we have several AI tools and things coming. But how are we going to structure this as an organization alongside the processes we already have?"

[128] "We haven't fully arranged that yet, but you want to do many things that people want now, like summarizing emails, with secure technology and not with all kinds of exotic tools where the data is then used for training and such things."

[129] "The policy is then mainly about the governance of AI applications? More about how to ensure that I implement and use AI safely within my organization?... Yes, yes, we developed that first, indeed, how do we ensure that in the development that is happening now, we at least don't make a mess using those kinds of tools."

[130] "Additionally, we are looking at whether all the policies we have are still current enough for the AI revolution or evolution."

[131] "And we are also looking at national and European policies, checking what that looks like and what it means for what we are going to do. We follow that, and as soon as it is available, we will implement it."

[132] "These are all new things, so you don't have a whole organization set up for them yet. So, we said we also want to handle this responsibly. So, we want to apply it responsibly. It also offers opportunities, and we can incorporate everything into policy and knowledge development. If we do nothing at all, that won't work, so we said we want to apply it responsibly, and there's still enough creative space where we can apply it."

[133] "So we say, we don't ban it, you can never use it, but we do say: don't use these kinds of tools for your work, not with work information or privacy-sensitive data. What comes out of it, don't put it in a memo or policy document."

[134] "Yes, yes, yes, we have established and communicated that. So, we also created a theme page on the intranet. We gave an interview for our staff magazine. We gave various presentations to different groups."

[135] "No, the city council, yes, yes, we really need to set up that ethics side, but we have already had a few discussions with the city council about what should be done there. And it's not new in a certain sense, because everything we do involves ethical considerations... The only difference is that it's much more urgent and under a magnifying glass, also due to things that went wrong in the past with governments."

[136] "No, our strategy is a bit of a first or fast follower, so in principle, we don't really need to do it ourselves, so we actually look for the highest possible level of abstraction to do these things because we don't believe that we as a municipality can do everything better on our own."

[137] "They also have something like, they don’t want to do everything only with market parties with all kinds of agendas and lock-ins and indeed bad things."

Employee Acceptance of AI

[138] "Yes, well, we talk a lot about it, these kinds of questions are often asked very early on. We do those things in advance so that if the pilot is successful, we can implement it quickly. But this sometimes takes a while at the start, leading to fewer pilots."

Experimentation Culture

[139] "But we do say, for example, if you want to see how such a tool works, and how to use an Open AI app, try it out, but not with municipal data or work-related things."

[140] "So we really say that we do it in a safe environment, short cycles just to see, does it work? Can it be done? Is it also accepted by certain employees or residents, possibly? But then, we will really look very specifically at pilots and experiments."

Responsible AI Governance Processes

[133] "So we say, we don't ban it, you can never use it, but we do say: don't use these kinds of tools for your work, not with work information or privacy-sensitive data. What comes out of it, don't put it in a memo or policy document."

AI Governance Literacy

[121] "Then we said we first need to develop more knowledge about it. So, we invited some people to give lectures. We are also going to organize sessions within the organization, broadly speaking, what is it, what can it do? What should you do with it and what do we actually not want as an organization? We said, well, knowledge building... It's going so fast, right? So I really notice that, it's going so fast, there's almost no knowledge that can keep up, so to speak."

AI Maintenance

Data Quality

[141] "Fortunately, we haven’t had much of this, but at some points, people had spent on things. Later, they had to buy back their own data because they hadn’t arranged it well. They thought, yes, I don’t need that data at all... If you want to do more analysis with it, it is interesting to have... And on security, there are also many things. And so you have to prepare for the next attack."

Data Infrastructure

[142] "What are the major tasks we have as a municipality? We now translate that into a vision of what we want to be able to do with data and ICT in a few years. We are now creating a roadmap to add to those annual plans and continuous portfolio things."

[143] "So it works and data platforms like that are part of long-term planning, so you say, well, we have a challenge with poverty, energy transition, and mobility. So, alongside working on short-term tasks, we will also create a roadmap for longer-term projects. They don’t need to be done immediately, but in the coming years."

Machine Learning Infrastructure

Other

[144] "Amsterdam used AI to classify those reports. We, together with a number of other municipalities and the VNG, set it up through the ICT innovation fund so that those reports come in and are processed more smartly and go to the right system."

[145] "We are also working together with other municipalities. We are indeed trying to align by following the development of use cases, for example in Brabant, but also nationally. So, we haven't structured it very well yet, a bit ad hoc through connections."

[146] "Yes, of course, the VNG is important. They set national frameworks, so you don't have to do it all over again every time. I think it's their responsibility to also do the lobbying."

8.4.6.2 Quotes about sub-questions

SQ 1: Will municipalities' AI strategies aim for a defined subjective adoption 'success'?

[150] "Yes, that's also the case for us, so yes, yes, we discussed that with the council, what are the real 'Bossche values,' so to speak, that we find important here, and you want to overlay that, but you don't want it to go completely off on its own. So, it's not a one-time thing, it's a bit of a search for how to make it specific enough so that it works here and still fits within that larger framework, the umbrella, so that it has enough impact that the market moves in that direction."

SQ 2: Is the negative public perception stemming from past AI cases significantly influencing the subjective interpretation of successful AI adoption and therefore municipalities' AI strategies?

[147] "So adjusting our procurement criteria, ethics is quite a thing. And privacy, well, privacy doesn't really matter whether it's AI or not. The only thing is that it's harder to check if you don't know exactly what a model does."

[148] "Yes, yes, we have arranged ethics quite tightly for privacy and ethics. For ethics, we are actually in the middle of that. So, we now have a first draft policy on ethics. We are working on setting up the ethics committee, so we are organizing that. It's now with someone in the organization."

[149] "No, the city council, yes, yes, we really need to set up that ethics side, but we have already had a few discussions with the city council about what should be done there. And it's not new in a certain sense, because everything we do involves ethical considerations... The only difference is that it's much more urgent and under a magnifying glass, also due to things that went wrong in the past with governments."

SQ 3: Is the subjective interpretation of 'successful' AI adoption influenced by the perceived current level of resources and capabilities?

SQ 4: Is the culture unsupportive of experimentation with AI due to fears that past AI failures might recur?

SQ 5: Do municipalities use traditional and rigid management structures that slow down AI adoption?

8.4.7 Interviewees F2 & F3

8.4.7.1 Quotes categorized in AI maturity dimensions

Management support

[151] "On other topics, we see that happening, but not yet with AI. However, on other topics, we do see that this happens frequently. Just like all other governments, we have a significant proportion of freelancers teaching us things."

[152] "But we also want to do that together with other parties so that it happens faster and more efficiently. So we often seek out these collaborations, but they are not yet available on all topics. For example, on a municipal data catalog, we are indeed involved in a large collaboration."

[153] "How does the feedback get communicated, and how do you move it to either a strategist in higher management or to the people in the municipalities who actually work with these tools? Honestly, if you're up for it, there is no process for that."

[154] "Yes, we still have a communication strategist and strategy to set up. So, a change communication plan, so I think you would need to use various means for that. It is not currently on the agenda."

AI opportunity literacy

[155] "Because large municipalities around us are now showing examples of what is possible, for instance with Digital Twins. But so far, it has mainly been about forecasting and similar things, although occasionally AI is involved. For example, tools we purchase offer AI capabilities, and then they ask additional questions."

Strategy development and communication

[156] "The background is that they have seen something at another municipality and want to do the same. That's generally what you see, but there is no single strategic driving force behind, 'Hey, how are we going to implement or adopt AI?' It does not exist."

[157] "So, no policy has been developed for that yet. There are some guidelines, but during the week of digital fitness, it was intended that these guidelines would be communicated within the organization, but it was pulled back at the last moment. One side says it's a hype, and we don't really need guidelines; eventually, it will be so normal that we use these things, so why do it now? And the other says, you really need to give people tools on how to use things or point out the risks. So, there is an undetermined piece, and nothing is communicated. The discussion also just stops and dies out."

[158] "What they mean is similar to when Google came with a search engine. No strategic policy was made then, and now everyone finds it normal to Google something. So, what these people are saying is, 'Why on earth should we create a strategic piece if everyone will find it as normal as a Google search engine in the future?' Yes, you can question whether that is indeed the case and whether this is not something completely different with very different potential risks. And the question is whether such a strategy would actually benefit our municipality, given the time you put into it."

Employee acceptance of AI

Experimentation culture

Responsible AI governance processes

[159] "When people think about it, the first remark you hear is, 'But I'm actually afraid to do it because there is no case law, no legislation, no regulation yet. So if I do this now, what risk am I taking, and could I potentially receive fines from the AP when a regulation is in place later?'"

[160] "And they are looking to see if they can create a sort of framework based on case law of what should and shouldn't be allowed, because there are simply no regulations yet."

[161] "They are also working on that. The discussion, for example, focuses on when a municipality should write something down and when the supplier should do it. For instance, as XXXX mentioned, we have a handful of suppliers who provide things for our legislation, such as Centric, which is possibly in 50% of municipalities for several applications."

AI governance literacy

[162] "We mainly explain the regulations that currently exist and those that are coming. That is also the only current question. What we do is create awareness about the algorithms and AI in products we purchase, because municipalities often cannot avoid that."

[163] "And there, I have once joined to explain how, in their specific case, the model works according to the supplier, because based on the supplier's texts, there is often not enough in-house knowledge to understand what the thing does."

[164] "We do not have collaborations on this. We do have a fairly large network from our data program with others, and occasionally we discuss these topics."

AI maintenance

Data quality

[165] "Regarding resources, I am also thinking about things like data quality, which is still not at the level required for AI."

[166] "Data quality still needs a lot of work. First, we need to make it visible for certain things and then address those issues."

[167] "If you have data quality for a new training set and you do not want to use a public training set because you cannot control the bias, which will probably be regulated, at least that's the trend we see, then you need to build a good training set yourself."

[168] "It is your chatbot, and you are responsible for the answers it provides. Regulation trends indicate that you must ensure you provide good training sets. You need to store your data correctly from your incoming channels and the answers given, and when you consider an answer to be good, so that the chatbot is correctly trained and maintained. You should do this periodically to keep it on track and avoid hallucinations."

Data infrastructure

[169] "We still have a lot on-premises; we are still working on migrating data as an asset to the cloud to be scalable. This is necessary to handle things properly."

[170] "We only have relational databases so far, no logical or data lakes, which makes it quite challenging to be technically advanced. So, we still need to work on that. The infrastructure is not yet in order."

[152] "But we also want to do that together with other parties so that it happens faster and more efficiently. So we often seek out these collaborations, but they are not yet available on all topics. For example, on a municipal data catalog, we are indeed involved in a large collaboration."

[171] "Our former municipal secretary was quite high up in Common Ground. What we get back from them is that municipalities struggle a lot to let go of their autonomy, often due to fear of security, control over infrastructure, and making decisions about whether an application is safe enough or not."

Machine learning infrastructure

Other

[172] "But collaborations on these kinds of things are rarely seen. You do see the use of platforms like Plyo to ask questions, but true collaboration is more about sharing information than working together. This is also due to the significant diversity in maturity levels regarding digitalization and data."

[168] "It is your chatbot, and you are responsible for the answers it provides. Regulation trends indicate that you must ensure you provide good training sets. You need to store your data correctly from your incoming channels and the answers given, and when you consider an answer to be good, so that the chatbot is correctly trained and maintained. You should do this periodically to keep it on track and avoid hallucinations."

[173] "Everyone wants to combine different data for safety reasons, and I think there are more than 200 municipalities wanting the same thing, but it is still quite challenging to organize. A lot is indicated via the VNG, but true collaboration remains a second issue."

[174] "You mentioned that collaboration is going reasonably well, but on the other hand, you also said that the collaboration is still insufficient or not of enough quality. Especially when you consider processes, many municipal processes are quite similar. Every municipality performs similar work continuously and must enforce the same laws and have the same primary tasks. Sometimes I miss the realization that there could be more opportunities to facilitate this at a higher level."

[175] "No, Common Ground goes further than that. Common Ground says, 'We have a system of basic registrations that all municipalities must implement, where we also act as a source but not as the source owner. We want to create a kind of national facilities from it. It is already that, but applications become much more uniform and are developed in the same way, with separate applications running independently of software companies.'"

[176] "We are all waiting for the national regulations. Interviewer: Yes, I think the national regulation should come from BZK, right? Yes, there are now guidelines and various things you can already fill in, and they have also made fields mandatory. But we are all still waiting to see what the regulation looks like, as it may deviate from the EU AI Act, which it has so far. At least the proposal differs significantly."

8.4.7.2 Quotes about sub-questions

SQ 1: Will municipalities' AI strategies aim for a defined subjective adoption 'success'?

[182] "So, those questions do arise, but it is no longer about deploying AI in a good way, but more about how we will properly establish ethics so that we can justify what we are doing."

SQ 2: Is the negative public perception stemming from past AI cases significantly influencing the subjective interpretation of successful AI adoption and therefore municipalities' AI strategies?

[159] "When people think about it, the first remark you hear is, 'But I'm actually afraid to do it because there is no case law, no legislation, no regulation yet. So if I do this now, what risk am I taking, and could I potentially receive fines from the AP when a regulation is in place later?'"

[177] "Yes, and what you do see is that questions are asked about how our digitalization agenda looks. I'm talking about the Council, and it involves how you handle algorithms. But then the question always turns to, 'Okay, and what do we arrange about ethics?'"

SQ 3: Is the subjective interpretation of 'successful' AI adoption influenced by the perceived current level of resources and capabilities?

[156] "The background is that they have seen something at another municipality and want to do the same. That's generally what you see, but there is no single strategic driving force behind, 'Hey, how are we going to implement or adopt AI?' It does not exist."

[178] "For example, there is no request within the service program specifically to use chatbots to support the helpdesk. This says something about the overall maturity in digitalization."

[179] "We are all waiting for that regulation because, especially for a municipality with less money, you cannot spend the money twice, as simple as that. So you prefer to wait for the regulation first."

[180] "Indeed, larger municipalities are much further along and can do much more. For instance, Amsterdam has its own development team for the Signals application, which it has developed and managed further. They have more money."

[181] "But as smaller municipalities, we still have a lot to do, just basics like improving data quality and our processes. There are still many steps to take."

SQ 4: Is the culture unsupportive of experimentation with AI due to fears that past AI failures might recur?

[159] "When people think about it, the first remark you hear is, 'But I'm actually afraid to do it because there is no case law, no legislation, no regulation yet. So if I do this now, what risk am I taking, and could I potentially receive fines from the AP when a regulation is in place later?'"

SQ 5: Do municipalities use traditional and rigid management structures that slow down AI adoption?