STRATEGIC AI DEPLOYMENT IN DECENTRALIZED ORGANIZATIONS

BALANCING CENTRAL OVERSIGHT WITH LOCAL FLEXIBILITY

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Abstract

What enables decentralized organizations to integrate Artificial Intelligence (AI) successfully, and how can they balance central control with local flexibility? Prompted by the complexities organizations face in harmonizing centralized AI strategies with decentralized operational needs, this study investigates essential components and managerial practices that support effective AI deployment in decentralized settings. By focusing on the regional water authorities in the Netherlands, this research draws on hybrid governance models, resource-sharing frameworks, and adaptive AI systems as strategic enablers of a balanced AI approach. Findings suggest that these components, coupled with cross-functional workshops and targeted knowledge-sharing initiatives, empower decentralized units to leverage AI capabilities in alignment with organizational goals while maintaining local autonomy.

The study supports these insights through qualitative analysis and contributes to the broader literature on AI integration by demonstrating how structured flexibility can drive both operational efficiency and innovation across diverse units. Additionally, it offers a practical framework for organizations seeking to enhance AI integration in ways that foster unit-level responsiveness and strategic coherence. Recognizing limitations related to the study's sector-specific context and qualitative scope, the study suggests directions for future research, including cross-industry validation to deepen understanding of AI's role in decentralized management. This research thus contributes both theoretical and practical insights into structuring effective AI strategies in decentralized organizations, highlighting pathways to enhance adaptability and performance.

Keywords: Artificial Intelligence, decentralized organizations, hybrid governance, resource pooling, strategic flexibility, regional water authorities

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1. Introduction

Integrating Artificial Intelligence (AI) within decentralized organizations represents a significant challenge in today's rapidly evolving digital landscape. As organizations expand their operations across diverse geographies, they must confront the inherent tension between maintaining central coherence and allowing for local adaptability in AI deployment. This tension emerges from the need to align AI strategies with overarching organizational goals while respecting the autonomy of individual units. On the one hand, centralized AI strategies promise streamlined coordination and efficiency, on the other, decentralized units require the flexibility to adapt AI applications to their unique contexts and operational needs (Weritz et al., 2024; Zheng et al., 2023). Balancing these contrasting requirements is not merely a technical issue but also a profoundly organizational one, involving strategic decisions that influence the deployment and effectiveness of AI across varied contexts. Although centralized strategies are vital for ensuring consistency and alignment with organizational goals, they often face challenges in accommodating the local variations that decentralized units demand (Papadopoulos & Charalabidis, 2021).

This research seeks to address the gap by examining key dimensions that influence the integration of AI in decentralized organizations. The study focuses on the critical challenges posed by the conflicting forces of centralization and decentralization in AI integration. By highlighting strategic capabilities such as cross-organizational collaboration and organizational socialization, the research aims to explore how these dimensions can be managed to ensure the effective deployment of AI across diverse, decentralized units. This approach will enhance the understanding of how AI can support both strategic coherence and operational flexibility in decentralized environments (Weritz et al., 2024; Zheng et al., 2023).

The primary objective of this research is to identify and explain the critical factors involved in integrating AI within decentralized organizations. Emphasizing specific managerial strategies such as fostering cross-functional collaboration and resource pooling, this study addresses the dual challenge of maintaining central coordination while allowing for operational flexibility in decentralized settings (Weritz et al., 2024; Zheng et al., 2023).

Several specific objectives have been identified to achieve this research's overarching goal. These objectives include defining the key components of an AI strategy that can adapt to decentralized organizational units' diverse technological capabilities and requirements and examining the role of managerial actions, such as fostering cross-functional collaboration and resource pooling, in successfully implementing AI strategies that align with central directives and local needs. The study also explores balancing centralized coordination with regional autonomy, ensuring the effective deployment of AI technologies across various organizational contexts.

The central research question guiding this study is:
How can an organizational AI strategy create synergies while allowing flexibility in decentralized organizations?

This question is further explored through the following sub-questions:

- *What are the essential components of an AI strategy that successfully integrates diverse technological capabilities across decentralized units?*
- *How can such a strategy be realized through managerial actions like organizing collaborative workshops and pooling resources?*

The significance of this study goes beyond the immediate task of integrating AI into decentralized organizations. As digital transformation accelerates, understanding how to implement AI effectively in diverse, decentralized structures is critical for organizations seeking to remain competitive and drive innovation. This research offers both academic and practical contributions, proposing a set of insights applicable across industries where decentralized management is prevalent. Additionally, the study provides practical solutions for managing the challenges of AI integration, advocating for a balance between centralized control and the flexibility needed at the local level. The focus on strategic coherence and operational flexibility makes this research particularly relevant for organizations aiming to enhance innovation and efficiency through AI.

By addressing these challenges and exploring the strategic capabilities necessary for successful AI integration in decentralized organizations, this research contributes to the broader discourse on digital transformation and innovation. It provides a structured approach to navigating the complexities of AI deployment in decentralized settings.

This thesis is systematically structured to address the research questions and provide a comprehensive analysis of AI strategy implementation within decentralized organizations. It begins with a thorough literature review that examines existing research on AI integration, the characteristics and dynamics of decentralized organizational structures, and the inherent tensions between centralization and decentralization, synthesizing current knowledge while identifying critical gaps that require further exploration. The subsequent chapter details the research methodology, outlining the design, data collection methods, and analytical approach to ensure rigor and validity. Following data collection and analysis, the results chapter presents the findings, offering a structured overview of insights gained from participants' perspectives and the practical challenges encountered, illuminating core areas where central oversight intersects with local adaptability. The thesis concludes with a comprehensive discussion interpreting the results' theoretical and practical implications, providing recommendations for organizations aiming to implement AI strategies in decentralized structures, and suggesting future research avenues to build upon these findings.

2. Theoretical Background

Integrating AI within decentralized organizations represents a challenge and an opportunity. AI holds the potential to revolutionize decision-making, innovation, and operational efficiency. However, its implementation requires navigating the tension between centralization and decentralization and fostering adaptability, local responsiveness, and innovation.

This chapter explores the theoretical underpinnings of AI strategies in decentralized organizations, focusing on the socio-technical complexities of aligning global coherence with local adaptability. The chapter provides a foundation for understanding how organizations can effectively integrate AI by synthesizing insights from centralization and decentralization theories and examining practical applications. Key areas include the balance between autonomy and oversight, the development of strategic capabilities, and the role of governance frameworks in achieving sustainable and context-sensitive AI implementation. These discussions directly address the core research question, highlighting the essential interplay of independence and collaboration in leveraging AI's transformative potential.

2.1. AI Strategies and Decentralized Organizations

AI represents a transformative force in modern organizations, offering unparalleled opportunities to enhance efficiency, decision-making, and innovation. However, its integration into decentralized organizational structures presents a significant challenge: balancing centralized control for consistency and scalability with decentralized flexibility for local responsiveness and innovation. AI's versatility enables applications across diverse contexts, but this also amplifies the complexity of managing its implementation effectively (European Commission, 2020; Nuseir & Refae, 2022).

This chapter explores the dual demands of centralization and decentralization in AI strategy design, emphasizing how organizations can leverage AI's technical capabilities while navigating its socio-technical complexities. The need for robust governance frameworks, adaptable implementation models, and strategic integration of AI within decentralized units highlights the importance of aligning technical precision with social and operational adaptability.

2.1.1. Defining AI Strategies and Decentralization

AI has become a cornerstone of modern innovation, driving change across industries through its capacity to process vast amounts of data, identify patterns, and make autonomous decisions. Unlike traditional technologies, AI's applications range from self-driving cars to personalized healthcare solutions (European Commission, 2020). The revolutionary nature of AI lies in its ability to model intelligent behavior, often

requiring minimal human intervention, which makes it a critical tool for addressing both routine and complex challenges (Nuseir & Refae, 2022). However, its integration into organizational strategies is not straightforward. Organizations must grapple with leveraging AI's technical potential, characterized by centralization for scalability and standardization, while allowing for its adaptability to diverse social and operational contexts through decentralization.

Rather than focusing on its historical origins, the value of understanding AI's foundational definitions lies in their implications for strategy design. At its core, AI encompasses technologies like machine learning and neural networks that enable systems to learn, reason, and interact with complex environments (Liu et al., 2021). This flexibility requires organizations to adopt strategic approaches that maximize AI's potential while addressing its technical and ethical complexities. For example, the European Commission (2020) emphasizes that AI systems combine data, algorithms, and computational power, which necessitates centralized coordination to ensure consistent data standards and compliance. Yet, the adaptability of these systems also requires decentralized implementation to meet the unique demands of localized contexts. This dual nature of AI underscores the need for organizations to balance central control with local flexibility.

Ruokonen and Ritala (2023) provide further nuance to this balance by outlining three archetypes of AI-first strategies: Digital Tycoon, Niche Carver, and Asset Augmenter. Each archetype highlights distinct approaches organizations can adopt based on their structure and strategic objectives. For instance, the Digital Tycoon model emphasizes centralized platforms and data governance, enabling global scalability and consistency. Conversely, the Niche Carver and Asset Augmenter strategies prioritize localized innovation, focusing on domain-specific AI solutions or leveraging physical assets for efficiency gains. These archetypes illustrate how organizations can navigate the interplay between centralization and decentralization by aligning their AI strategies with both global and local needs.

An AI strategy is therefore more than just the adoption of technology; it is a structured approach to embedding AI capabilities across an organization to drive innovation, efficiency, and competitive advantage (Polyviou & Zamani, 2023). Such strategies must account for technical dimensions, including the integration of vast datasets and the maintenance of robust data governance frameworks, as well as social dimensions, such as transparency, trust, and ethical considerations (Papadopoulos & Charalabidis, 2021). Centralization plays a key role in addressing these concerns, enabling organizations to establish consistent standards for data quality, privacy, and regulatory compliance. This central coordination ensures that AI systems deliver accurate and reliable insights across all units while mitigating risks related to data misuse or bias (European Commission, 2020).

At the same time, decentralization is essential for tailoring AI applications to meet the specific needs of individual units or regions. For instance, decentralized units in a global organization may face unique regulatory environments or market conditions that require localized customization of AI models. This autonomy allows teams to adapt AI technologies to their contexts, fostering innovation and responsiveness (Rasel, 2016). By granting decentralized units the freedom to align AI solutions with local conditions, organizations can ensure that global strategies remain relevant and effective at the operational level (Polyviou & Zamani, 2023). This decentralized approach also promotes stakeholder trust by involving local teams and communities in decision-making, making AI applications more inclusive and culturally appropriate (Zheng et al., 2023).

The interplay between centralization and decentralization becomes particularly significant when considering the broader organizational goals of agility and resilience. Centralization provides the structural backbone for consistency, scalability, and ethical governance, while decentralization fosters the adaptability needed to respond to dynamic market changes and localized challenges (Kraus et al., 2022; Wang et al., 2023). This balance is especially pertinent in complex, geographically dispersed organizations where operational success depends on both alignment with overarching objectives and flexibility in execution.

In practice, achieving this balance requires a hybrid approach. Centralized frameworks provide the infrastructure for data governance and regulatory compliance, ensuring coherence across the organization. Meanwhile, decentralized units leverage this foundation to innovate and adapt AI applications to their specific needs. For example, centralized teams may develop shared algorithm libraries and data repositories, while decentralized units customize these tools to optimize local operations, such as adjusting predictive models to reflect regional customer preferences or regulatory requirements (Polyviou & Zamani, 2023; Rasel, 2016).

By integrating insights from both centralization and decentralization, organizations can foster a collaborative environment where local innovations feed back into global strategies, enhancing overall adaptability and resilience. This dynamic interaction not only ensures that AI systems align with organizational goals but also allows them to evolve in response to new challenges and opportunities. Ultimately, the strategic integration of AI within decentralized organizations highlights the importance of balancing independence and collaboration, enabling organizations to harness AI's transformative potential while navigating the complexities of a decentralized structure.

2.1.2. Core Components of AI Strategies in Decentralized Settings

Developing an effective AI strategy for decentralized organizations requires a delicate balance between centralized oversight and decentralized autonomy. This balance

ensures that organizations can achieve synergy across dispersed units while maintaining the flexibility needed for local responsiveness. Central to this effort is the establishment of a robust data infrastructure and governance framework. As the backbone of AI-driven processes, data must flow seamlessly and securely across units, adhering to centralized policies on integrity and accessibility while allowing decentralized units the freedom to adapt data usage to their unique operational demands (Polyviou & Zamani, 2023). A cohesive data ecosystem ensures that AI applications remain both globally consistent and locally relevant, directly addressing the dual challenge of centralization and decentralization.

Equally critical to an AI strategy in decentralized settings are mechanisms for collaboration and knowledge sharing. Collaborative platforms and AI-enabled communication tools facilitate the exchange of insights, model results, and best practices, preventing the formation of isolated data silos and promoting alignment with organizational objectives (Kraus et al., 2022). In addition to technological solutions, structured practices such as cross-functional workshops and inter-unit project teams foster meaningful engagement and alignment across units, reinforcing both local innovation and centralized strategic coherence (Zheng et al., 2023). These collaboration mechanisms exemplify how decentralization can coexist with central coordination, providing the flexibility to innovate while adhering to shared goals.

Another essential component is ethical and regulatory compliance, which necessitates a centralized framework to ensure consistency across diverse jurisdictions. Centralized ethical governance establishes baseline standards for transparency, privacy, and accountability, enabling decentralized units to operate within these boundaries while meeting local legal requirements and cultural expectations (European Commission, 2020; Papadopoulos & Charalabidis, 2021). This framework not only mitigates risks associated with AI deployments but also fosters trust among stakeholders, ensuring that AI applications align with both organizational values and regional norms. By incorporating adaptive AI systems, organizations can enhance this balance, allowing decentralized units to modify algorithms based on localized data inputs and specific operational conditions. These systems create models that are both globally consistent and tailored to local needs, highlighting how centralized and decentralized approaches can complement each other (Wang et al., 2023).

Centralized oversight is indispensable in maintaining coherence across decentralized AI implementations. Clear guidelines for AI use and performance metrics enable the organization to maintain consistency in data quality and system performance while avoiding bottlenecks that could hinder local innovation (Polyviou & Zamani, 2023; Rasel, 2016). However, decentralized autonomy must also be preserved to empower local units to adapt AI applications to their unique environments. This dual approach ensures that units respond quickly to dynamic market conditions while aligning with overarching objectives. Continuous learning and feedback mechanisms further strengthen this balance by enabling real-time monitoring and optimization of AI models.

Automated feedback systems allow decentralized units to refine their implementations based on insights drawn from organization-wide data, creating a dynamic loop of improvement and adaptation (Zheng et al., 2023). This iterative process ensures that AI strategies remain agile in the face of rapid technological and market shifts.

Human-AI collaboration and employee training represent the final pillar of a comprehensive AI strategy in decentralized organizations. Building digital literacy and fostering an understanding of AI's strategic potential enable employees to work more effectively alongside AI systems, maximizing both human and technological capabilities (Fitzgerald et al., 2013). By actively engaging employees in the process, organizations can encourage innovation and ensure that AI systems are integrated seamlessly into decision-making workflows. This investment in human-AI interaction enriches operational processes and supports a culture of adaptability and trust, which is critical for organizations operating in diverse and decentralized environments (Zheng et al., 2023).

2.1.3. Challenges of AI Strategies in Decentralized Settings

Implementing AI strategies within decentralized organizations brings distinct challenges, primarily revolving around balancing central coherence with local flexibility. One core challenge lies in maintaining consistent data quality across dispersed units. For AI systems to function effectively, data from each unit must adhere to standardized formats and quality benchmarks. However, decentralized organizations often operate in diverse environments, making data collection practices inconsistent. This variability can lead to disparities in data quality, which ultimately affect AI model performance and reliability. Ensuring a unified data governance structure that enforces consistency while allowing units the freedom to adapt to regional nuances is crucial but difficult to achieve (Polyviou & Zamani, 2023).

Adding to these challenges, Lichtenthaler (2020) identifies five maturity levels of AI management, ranging from Isolated Ignorance to Integrated Intelligence, that provide insight into the uneven progression of AI adoption across units in decentralized organizations. Units at lower maturity levels cannot often implement standardized practices, leading to fragmented AI initiatives and inconsistent data practices. Meanwhile, units at higher maturity levels are better positioned to align with centralized data governance while tailoring AI applications to local contexts. This disparity underscores the need for organizations to adopt flexible governance models that can accommodate varying levels of AI readiness while fostering the overall progression of all units toward integrated intelligence.

Another significant challenge is establishing robust collaboration frameworks that support the sharing of AI insights and resources across units without causing information overload. In decentralized settings, siloed operations can hamper the flow of knowledge, resulting in isolated data pools and duplicated efforts. While

collaborative platforms help in sharing insights, their effectiveness is hindered if employees and managers in decentralized units lack training or engagement with these systems. Building an AI-friendly culture where all units understand and utilize shared tools consistently is challenging, particularly when units are accustomed to independent workflows. Furthermore, balancing autonomy with the necessary oversight becomes increasingly complex as organizations scale. While autonomy empowers local units to innovate and respond to unique conditions, unchecked independence can lead to misaligned strategies, where local AI applications diverge from central organizational goals, undermining cohesion and efficiency (Kraus et al., 2022; Zheng et al., 2023).

Ethical and regulatory compliance introduces further complexity in a decentralized AI strategy. Each unit may operate in a different regulatory environment with varying standards for data privacy, security, and ethical AI practices. Coordinating compliance across these diverse jurisdictions is an ongoing challenge, as it requires decentralized units to interpret and adhere to both local and central guidelines. The potential for inconsistencies in adhering to these standards is high, especially in complex regulatory landscapes where regional compliance needs can conflict with organizational objectives (European Commission, 2020). Establishing a strong ethical governance framework that aligns with local laws without compromising organizational values demands substantial oversight and flexibility, particularly in highly regulated sectors like healthcare or finance (Papadopoulos & Charalabidis, 2021).

Decentralized organizations also face the challenge of limited adaptability in AI models. AI systems in such organizations must be flexible enough to cater to local demands but consistent enough to maintain an overall strategic alignment. This requires continuous adaptation of AI models to account for regional differences, often leading to increased complexity in managing AI implementations across various units. Developing adaptive models is resource-intensive, and many organizations struggle to balance the resources required for continuous training and model updating. As models become more complex, the risk of technical issues and performance degradation increases, making it essential to allocate sufficient resources to monitor and refine these models across the organization (Wang et al., 2023).

Finally, fostering human-AI collaboration across decentralized units presents its own set of challenges. Integrating AI systems within each unit requires employees to adapt to new workflows and decision-making processes, often involving extensive training and skill development. In decentralized settings, ensuring consistent training quality across units can be difficult due to variations in local resources and capabilities. Resistance to change is another barrier, as employees who are accustomed to traditional workflows may hesitate to rely on AI-driven insights. Overcoming this resistance necessitates a proactive change management strategy that emphasizes the value of AI in enhancing, rather than replacing, human decision-making processes. Furthermore, promoting collaboration between AI systems and employees requires

ongoing support to address technical and practical issues as they arise, which can be resource-intensive in decentralized settings with limited centralized oversight (Fitzgerald et al., 2013; Zheng et al., 2023).

Overall, the challenges of implementing AI strategies in decentralized organizations presents various challenges, including data governance, collaboration, regulatory compliance, adaptability, and human-AI interaction. Tackling these issues requires a delicate balance between local autonomy and central oversight, fostering a culture that appreciates both innovation and alignment. As organizations confront these complexities, they should be ready to invest in essential infrastructure, training, and adaptive strategies to fully harness AI's potential within a decentralized framework.

2.1.4. Balancing Autonomy and Central Coordination in AI Strategies

In a decentralized organization, striking a balance between autonomy and central coordination is crucial for a successful AI strategy. Autonomy empowers decentralized units to tailor AI applications to meet local demands, promoting innovation and flexibility. On the other, central coordination guarantees alignment with broader objectives, ensuring consistency throughout the organization. Attaining this balance requires strategic capabilities that facilitate both independent operations and inter-unit collaboration, allowing decentralized units to function efficiently while following a cohesive vision (Weritz et al., 2024).

Strategic capabilities may be essential for maintaining this balance. According to Weritz et al. (2024), complementary capabilities such as absorptive capacity, cross-functional collaboration, and organizational agility facilitate the integration of decentralized innovation with central oversight. These capabilities strengthen the connections between units, allowing decentralized teams to leverage local insights while adhering to central guidelines. For instance, absorptive capacity enables units to recognize and integrate knowledge from the broader organization, enhancing their ability to innovate within a shared strategic framework. This synergy reinforces the organization's ability to maintain alignment without stifling the creativity and responsiveness of decentralized teams.

Effective cross-functional collaboration plays a critical role in aligning decentralized units with central strategies. By fostering open communication and resource sharing, collaboration ensures that decentralized efforts remain consistent with organizational goals. Shared platforms for real-time exchange of AI insights and model outputs are particularly valuable, as they allow central teams to monitor developments across units and provide targeted support where needed (Zheng et al., 2023). Additionally, cross-functional practices such as inter-unit workshops and collaborative project teams promote standardization of data and AI models while preserving the flexibility to address local requirements (Kraus et al., 2022). These mechanisms bridge the gap

between autonomy and coordination, enabling decentralized units to remain agile while contributing to the organization's overall objectives.

Adaptive governance structures are another critical component for balancing autonomy and central coordination. A unified but flexible governance framework provides clear ethical and regulatory guidelines, ensuring consistent adherence to organizational values while allowing decentralized units to address region-specific requirements. For instance, a set of foundational ethical principles can establish baseline standards for transparency and accountability, while permitting adjustments for local legal and cultural contexts (European Commission, 2020; Polyviou & Zamani, 2023). This approach reduces compliance risks and fosters an ethically responsible AI deployment across diverse environments. Such governance structures exemplify how centralization and decentralization can complement each other, creating a framework that aligns local innovation with global consistency.

Organizational agility further enhances the ability to balance local autonomy and centralized oversight. Agility allows decentralized units to quickly adapt to changing market conditions while maintaining alignment with overarching strategies (Weritz et al., 2024). When paired with innovation capabilities, agility empowers decentralized teams to experiment with and refine AI applications tailored to specific market conditions, contributing to localized innovation within a cohesive organizational framework. This adaptability ensures that the organization can respond to both global challenges and local opportunities, maintaining a competitive edge in a dynamic environment.

Leadership and communication are equally crucial in maintaining this balance. Strong leadership provides a shared vision that connects decentralized initiatives with central goals, ensuring that all units understand the strategic purpose behind AI efforts. Clear and consistent communication from leaders fosters trust, facilitates information sharing, and reinforces the need for alignment while respecting the autonomy of each unit (Polyviou & Zamani, 2023). Furthermore, investing in training programs to enhance digital literacy and the use of collaborative tools strengthens the organization's capacity to balance autonomy with central coordination. These programs empower employees to engage effectively with AI systems, maximizing their contributions to both local and global objectives (Fitzgerald et al., 2013; Weritz et al., 2024).

Ultimately, achieving a dynamic balance between autonomy and central coordination in decentralized organizations requires a combination of strategic capabilities, adaptive governance, organizational agility, and effective leadership. Together, these components create an environment where decentralized units can innovate and respond to local demands while contributing to the organization's overall strategic goals. This hybrid approach ensures that AI's potential is maximized across the organization, driving both operational excellence and sustainable growth.

2.2. Strategic Capabilities for AI Integration

Strategic capabilities are at the core of effectively integrating AI into decentralized organizations, enabling them to navigate the dual challenge of global coherence and local adaptability. These capabilities empower organizations to maximize the value of AI technologies while addressing the socio-technical complexities inherent to their implementation. By fostering innovation, resource sharing, and responsiveness, strategic capabilities provide the foundation for aligning AI initiatives with both organizational objectives and diverse operational contexts. This section explores the critical role of these capabilities, emphasizing their importance in balancing technical precision with social adaptability for sustainable AI integration.

2.2.1. The Role of Strategic Capabilities in AI Integration

Strategic capabilities are foundational for AI integration because they determine an organization's capacity to adapt, innovate, and maximize the value of AI tools within its existing structure. According to Weritz et al. (2024), strategic capabilities such as absorptive capacity, innovation capability, and learning agility are critical for digital transformation, as they allow the organization to assimilate new technologies and respond to market shifts. Absorptive capacity is essential for recognizing and acquiring knowledge from AI advancements and integrating these insights into actionable strategies. This capability enhances the organization's ability to learn from AI applications and ensures that AI-generated insights can be effectively utilized across units (Weritz et al., 2024).

Moreover, innovation capability enables organizations to develop new AI-driven solutions and improve existing processes, helping them maintain a competitive edge in a rapidly evolving technological landscape. Innovation capability is precious in organizations pursuing decentralized AI strategies, as it allows each unit to experiment and tailor AI applications to specific needs while remaining aligned with the overall organizational framework. Combined with a culture that values continuous improvement and adaptation, these strategic capabilities allow organizations to integrate AI to enhance resilience, foster agility, and drive growth.

2.2.2. Spanning Capabilities and Resource Sharing

Spanning capabilities are essential for bridging the gaps between different units and facilitating the flow of resources and information needed for successful AI integration. These capabilities include cross-functional collaboration, knowledge sharing, and centralized coordination mechanisms that allow decentralized units to access centralized resources, such as data and AI models, while also contributing local insights and developments back to the organization. Effective spanning capabilities help to reduce redundancy by enabling units to share AI-driven insights and avoid

duplicative efforts, which is particularly beneficial in large, complex organizations (Kraus et al., 2022; Weritz et al., 2024).

Resource sharing is a practical application of spanning capabilities. It is critical to ensure that all units within a decentralized organization have access to the tools and data necessary for AI integration. By establishing a shared resource pool for AI-related assets, such as data lakes, computing power, and algorithm libraries, organizations enable units to operate with greater efficiency and consistency. Spanning capabilities combined with resource-sharing frameworks create an environment where innovation can flourish, and AI applications can evolve in response to both local and global organizational needs.

2.2.3. Inside-out and Outside-in Capabilities

AI integration requires combining inside-out and outside-in capabilities to balance internal strengths with external opportunities. Inside-out capabilities leverage an organization's strengths, such as data assets, technical expertise, and proprietary models, to create value through AI. These capabilities emphasize the importance of utilizing internal resources and knowledge to develop AI applications that are aligned with organizational goals and can be scaled across units (Weritz et al., 2024). For example, an organization with solid data management systems can leverage this internal strength to develop AI models that provide high-quality insights, which decentralized units can tailor to their specific operational needs.

In contrast, outside-in capabilities enable organizations to respond to external developments, including technological advancements, market trends, and customer needs. Outside-in capabilities allow organizations to integrate insights and technologies from external sources into their AI strategy, helping them stay competitive in a rapidly changing environment. This perspective is crucial for decentralized organizations, where local units may be closer to emerging customer demands or regional trends. Outside-in capabilities ensure that these insights can influence central strategy, allowing the organization to remain agile and customer-focused. This integration of external insights is supported by spanning capabilities, which facilitate the flow of market knowledge from decentralized units back to central leadership, helping to create a responsive and adaptable AI framework (Weritz et al., 2024).

Balancing inside-out and outside-in capabilities ensures that an organization can harness its internal resources while remaining responsive to external opportunities, creating a comprehensive approach to AI integration. By fostering both perspectives, organizations can build a strategic AI framework grounded in internal strengths but flexible enough to adapt to external changes, making AI a driver of sustained competitive advantage. This balanced strategy positions AI not just as a means for operational efficiency, but also as a driver for organizational transformation and growth.

2.2.4. Socio-Technical Perspectives

The integration of AI in decentralized organizations cannot be fully understood without acknowledging its socio-technical dimensions. AI poses unique challenges because of its dual nature: technical sophistication and deep entanglement with social dynamics. These complexities arise from AI's broad applicability, which generates diverse expectations across stakeholders and demands a nuanced approach to management (Akintunde et al., 2023; Tekic & Füller, 2023). The socio-technical perspective emphasizes that effective AI integration requires addressing both the technical properties of AI systems and the organizational and societal contexts in which they are deployed.

Dell' et al. (2023) introduce the concept of the 'jagged technological frontier,' which captures the uneven performance of AI across tasks with varying complexity. While tasks within AI's capability spectrum enhance productivity and decision-making, tasks outside this spectrum can lead to inefficiencies or even performance degradation. This underscores the socio-technical necessity of ensuring that AI applications are carefully matched to the needs and competencies of decentralized units. By navigating this uneven frontier, organizations can better align their technological capabilities with the diverse human and operational contexts across decentralized structures.

One critical socio-technical challenge is managing trust in AI systems. Trust is a function of technical reliability and the perceived fairness, transparency, and ethical alignment of AI applications (Akintunde et al., 2023). Building trust requires organizations to develop strategic capabilities that ensure ethical governance and proactively address stakeholder concerns. For instance, centralized ethical guidelines must be adapted to local cultural and regulatory contexts to maintain stakeholder confidence while supporting decentralized innovation.

Furthermore, the socio-technical perspective highlights the need for collaboration between technical experts, organizational leaders, and end-users to align AI initiatives with both operational goals and broader societal values. This alignment is essential for navigating the expectations of diverse stakeholders, from employees adapting to new workflows to customers demanding transparency in AI-driven decisions. Tekic & Füller (2023) argue that managing such diverse expectations necessitates a strategic focus on fostering cross-functional collaboration and continuous learning, enabling organizations to address the human and technical complexities of AI adoption.

Another dimension of the socio-technical perspective is the importance of resource sharing and spanning capabilities in resolving tensions between central and local units. Vial et al. (2023) highlight that effective resource-sharing frameworks must not only provide access to centralized data and computational tools but also facilitate the integration of localized knowledge into central strategies. This two-way flow of

resources and insights ensures that AI applications remain contextually relevant while adhering to organizational standards.

By incorporating socio-technical perspectives, organizations can better address the challenges of AI integration in decentralized settings. This approach ensures that AI systems are technically robust, socially acceptable, and aligned with organizational goals and societal expectations. The socio-technical perspective adds depth to the understanding of strategic capabilities, highlighting the interplay between technical proficiency and social adaptability in achieving successful AI integration.

2.3. Combining Theoretical Perspectives and Practical Applications

Integrating AI strategies in decentralized organizations requires a nuanced understanding of both centralization and decentralization theories, alongside practical governance frameworks. This synthesis forms a cohesive strategy that navigates the socio-technical complexities of AI while addressing the central struggle: balancing global consistency with local responsiveness. By combining theoretical insights with actionable practices, organizations can align innovation with strategic coherence, fostering sustainability in AI deployment.

2.3.1. Synthesis of Centralization and Decentralization Theories

Centralization and decentralization theories serve as the dual pillars of a balanced AI strategy. Centralization theory underscores the need for consistent policies, standardized processes, and unified data governance. These centralized elements are critical for ensuring scalability, ethical compliance, and the integrity of AI systems across dispersed units (European Commission, 2020; Weritz et al., 2024). A centralized approach also mitigates risks related to inconsistent data practices and regulatory adherence, providing a stable foundation for global AI initiatives.

In contrast, decentralization theory emphasizes autonomy, allowing local units to adapt AI systems to diverse operational contexts. This approach is particularly valuable in addressing dynamic regulatory environments and cultural differences, which centralized frameworks might overlook. Decentralized strategies foster resilience and innovation by empowering teams to tailor AI applications to specific market needs, enhancing both customer responsiveness and operational flexibility (Polyviou & Zamani, 2023).

The interplay between these theories highlights the socio-technical duality of AI. While centralization enables technical coherence and data reliability, decentralization supports the social adaptability needed for inclusivity and relevance in localized settings. A hybrid approach bridges this gap: centralized governance ensures ethical

and technical consistency, while decentralized units implement AI in context-sensitive ways. This synthesis allows organizations to dynamically align local innovations with overarching strategic goals.

2.3.2. Practical Applications of Theoretical Perspectives

Translating these theories into practice requires robust governance frameworks and collaborative mechanisms. Centralized governance committees provide the structural backbone for consistency, defining ethical standards, regulatory benchmarks, and data quality protocols (European Commission, 2020). These committees ensure that decentralized units operate within established boundaries, fostering trust and accountability.

At the operational level, decentralized teams implement localized AI applications to address region-specific challenges. For example, predictive analytics tailored to local market demands enables units to optimize inventory and personalize customer experiences. This localization exemplifies the adaptive potential of decentralized AI strategies, where operational relevance is achieved without compromising global coherence (Zheng et al., 2023).

Resource-sharing frameworks further operationalize the hybrid model. Centralized data lakes, algorithm libraries, and computational tools enable decentralized units to access essential resources while customizing them for local applications (Kraus et al., 2022). Such frameworks reduce redundancies, promote knowledge flow, and ensure that AI solutions remain both scalable and contextually relevant.

Collaborative practices, including cross-functional workshops and inter-unit project teams, strengthen the integration of centralized and decentralized efforts. These practices encourage the exchange of insights and foster alignment across units, creating a culture of shared innovation (Weritz et al., 2024). For instance, decentralized teams can share localized adaptations of AI models, which, in turn, inform central strategies and improve organizational agility.

2.4. Conceptual Framework

The conceptual framework for this study integrates theoretical insights and findings to represent the dynamic interactions between key variables visually. It highlights how central coordination and local adaptation influence AI integration success, mediated by strategic capabilities. It also captures the feedback loops and two-way interactions between central coordination and local adaptation, emphasizing their mutual influence rather than a one-directional relationship.

Central coordination refers to the top-level mechanisms, such as strategic oversight and governance structures, that ensure consistency, alignment with organizational

objectives, and resource efficiency across decentralized units. In contrast, local adaptation represents decentralized units' autonomy to modify AI applications to meet region-specific operational, environmental, or regulatory needs. The two-way arrow between these variables indicates their interdependence: central coordination provides overarching guidance, while insights from local adaptation feed back into central strategies to refine policies and frameworks based on regional experiences and challenges.

At the core of the framework, strategic capabilities mediate this relationship. These capabilities, such as absorptive capacity, innovation capability, and cross-functional collaboration, enable decentralized units to effectively leverage centralized guidance and localized flexibility. Moreover, the feedback loop from strategic capabilities to central coordination and local adaptation illustrates how enhanced capabilities (e.g., improved knowledge-sharing, and innovation processes) can refine and inform central strategies and local adaptations over time, creating a dynamic and iterative process of learning and improvement.

Ultimately, this framework captures how central coordination and local adaptation interact and evolve to facilitate AI integration success. The resulting outcomes include alignment with organizational goals, enhanced innovation, and improved operational performance supported by governance structures that balance consistency with flexibility. These dynamics ensure sustainable and scalable AI deployment across decentralized units.

Figure 1. Conceptual Framework for AI Integration Success in Decentralized Organizations illustrates this conceptual framework:

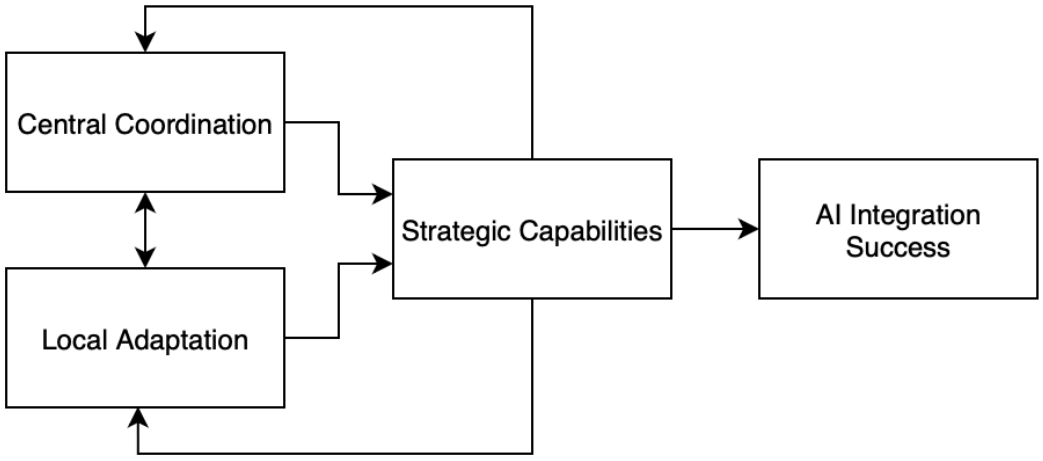

Figure 1. Conceptual Framework for AI Integration Success in Decentralized Organizations

3. Methods

This chapter presents the methods used to explore AI strategy implementation within a decentralized organizational structure, adopting a qualitative, inductive approach tailored to the study's complex and exploratory nature (Bryman & Bell, 2011; Patton, 2015). Through this design, the study aims to develop a nuanced understanding of how strategic AI decisions are interpreted and enacted across autonomous units. Following an outline of the research design, the chapter describes the case context, which includes a central coordinating body and multiple regional water management units in the Netherlands. Semi-structured interviews with open-ended questions were selected as the primary data collection method, allowing participants to share in-depth perspectives and allowing themes to emerge naturally (Bryman & Bell, 2011; Patton, 2015). The data collection process is further detailed, including the ethical considerations implemented to protect participant confidentiality, data security, and informed consent. Finally, the chapter details the thematic analysis method employed to interpret the qualitative data, systematically identifying and organizing patterns within the dataset (Braun & Clarke, 2006). Together, these methods provide a comprehensive framework for understanding AI strategy in decentralized organizations and lay the groundwork for the insights presented in the findings.

3.1. Research Design and Approach

A qualitative, inductive approach was selected as the most appropriate design for this study, which explores AI strategy implementation within a decentralized organization. This choice aligns with the research's exploratory nature and the need for a deep understanding of nuanced organizational practices. Qualitative research methods are ideal for topics like AI strategy in decentralized settings, where the phenomena are relatively new, and empirical data is limited (Hammarberg et al., 2016). This research, therefore, emphasizes developing an understanding grounded in participants' experiences and perspectives, allowing insights to emerge organically rather than following predefined hypotheses (Creswell, 2018). An inductive approach enables the identification of patterns within participants' narratives and documents from organizations. This clarifies how strategic AI decisions are interpreted and implemented at different levels in decentralized structures. Since decentralized organizations often consist of diverse units, each with its level of independence, this method captures various perspectives, giving a comprehensive view of their strategies and responses (Gioia et al., 2013). Such depth is essential for understanding the complex interactions between central strategic direction and local adaptations.

Semi-structured interviews are the primary data collection method to gather in-depth insights. This interview format provides a flexible yet focused framework, where participants can discuss their unique perspectives on AI strategy while delving into specific areas of relevance as they arise. Semi-structured interviews are especially effective for exploring complex organizational topics like AI strategy, as they enable the

collection of rich, detailed responses, revealing underlying perceptions, challenges, and adaptation strategies within each unit (Patton, 2015). The flexibility of this approach allows for probing and follow-up questions, fostering an environment where interviewees can elaborate on their experiences in detail. Thematic analysis was chosen as the primary method for analyzing the interview data. This approach is suitable for inductive studies as it systematically identifies, analyzes, and interprets recurring themes within qualitative datasets (Braun & Clarke, 2006). The thematic analysis allows codes and patterns to be organized into coherent themes, revealing insights into key issues such as strategic alignment, local adaptation and challenges specific to decentralized settings. This method's flexibility also allows themes to be refined throughout the analysis process, which aligns well with this research design's iterative and adaptive nature (Braun & Clarke, 2006).

In conclusion, this qualitative, inductive design, incorporating semi-structured interviews and thematic analysis, was selected for its ability to capture the complexity of decentralized AI strategy implementation. This approach enables the generation of new insights into organizational dynamics that have not been extensively studied, offering a valuable foundation for future research into AI strategy in complex, decentralized settings.

3.2. Case Description

This research examines the strategic integration of AI within a central coordinating body and multiple regional water management authorities in the Netherlands. While these authorities share a common mission of managing water resources, they operate independently, with varied levels of digital maturity and distinct approaches to AI adoption. The central body plays a supportive role, offering guidelines and encouraging collaborative digital initiatives across these decentralized organizations. It helps facilitate shared digital projects, though each authority retains flexibility in implementing AI according to its unique operational needs and resources. This study delves into the specific organizational and regulatory challenges these regional authorities face when deploying AI. Some authorities, for instance, are exploring predictive analytics and automated monitoring techniques, while others proceed cautiously, citing data governance concerns, limited resources, or cultural resistance to digital innovation. Several of these organizations have independently initiated AI projects to streamline operations, yet sector-wide integration of such projects remains limited. This highlights the need for a shared but adaptable strategic vision that can address local needs while supporting cohesive sectoral growth. The regulatory landscape significantly shapes AI use across these water management authorities, who must comply with data protection mandates and ethical requirements standards for public sector organizations. The central body supports these authorities by providing frameworks, such as digital transformation guidelines, and coordinating pilot programs that promote data-driven approaches while addressing compliance requirements. While findings from this study may be applicable to other decentralized sectors, they are specifically tailored to the

Dutch water management context, where environmental imperatives, public accountability, and inter-organizational collaboration shape AI strategy.

3.3. Data Collection Procedures

This study employed semi-structured interviews with open-ended questions as the primary data collection method to gain a nuanced understanding of AI strategy and implementation across a decentralized organizational structure. Semi-structured interviews are particularly suitable for qualitative research in complex organizational settings, as they offer the flexibility to explore participants' responses in depth while ensuring that core topics are consistently covered across interviews (Patton, 2015). Unlike structured interviews, which restrict responses to pre-defined categories, semi-structured interviews encourage participants to elaborate on their experiences, insights, and interpretations, enabling the researcher to probe deeper into emergent themes and clarify ambiguities as they arise (Savin-Baden, 2013). The decision to use open-ended questions further supports this study's focus on uncovering detailed, context-specific insights into AI strategy and adoption. Open-ended questions allow respondents to answer in their own words, facilitating a conversational flow revealing complex layers of meaning, intention, and perception often hidden in rigidly structured responses (Bryman & Bell, 2011). This approach aligns with the interpretive paradigm in qualitative research, which emphasizes understanding phenomena from the perspectives of those involved and encourages a depth of insight that structured methods may not capture (Creswell, 2018). Using semi-structured interviews also allowed for adapting questions dynamically based on the interviewee's responses. This flexibility was crucial in this study's context, as the organization's decentralized structure meant that participants had varying roles, responsibilities, and expertise related to AI. By tailoring follow-up questions to each interviewee's particular context, the researcher could explore unique, role-specific perspectives on AI strategy, ensuring a comprehensive understanding across the organization's various units (Baharein & Noor, 2008). Furthermore, as Sobh & Perry (2006) discuss, semi-structured interviews align well with an inductive research approach, where understanding is built progressively, and themes are allowed to emerge organically from the data rather than being imposed beforehand. To ensure consistency and depth in data collection, semi-structured interviews were conducted, guided by a standardized interview protocol. The complete protocol and the interview questions can be found in Appendix B.

The choice of virtual interviews, conducted via Microsoft Teams, effectively covered participants' geographic distribution. Microsoft Teams provided a unified platform for remote interviews and transcription, ensuring efficient and consistent data capture without requiring participants to travel or adjust their schedules significantly. Each interview covered the same foundational topics but allowed us to delve deeper based on participants' answers, using probes and follow-up questions that encouraged elaboration and reflection on key issues related to AI and organizational strategy. In total, 14 participants from 11 different regional units and the central coordinating body

were interviewed and selected based on their connection to a technical advisory platform linked to the central body. While most interviewees were members of this platform, some were referred by colleagues who believed they had a more relevant perspective on AI-related issues. The flexibility of the semi-structured format, combined with open-ended questions, enabled capturing rich insights across roles, making it an ideal choice for examining the multi-dimensional nature of AI strategy within a decentralized organization.

Ethical protocols were integrated into the data collection process to ensure participant confidentiality and data protection. Before interviews were scheduled, each potential participant received an initial email invitation detailing the study's purpose and process (Appendix B). This email included information on the recording of interviews via Microsoft Teams, the transcription process, and assurances of data confidentiality. Participants were informed that their responses would be anonymized, with all identifiable details removed, and that recorded data would be used exclusively for the thesis. Furthermore, the university of Twente Privacy Contact Person confirmed that a formal consent form was not required, as no sensitive personal data would be collected or published in this study.

At the start of each interview, consent to record the conversation was verbally obtained after an additional explanation of data privacy and usage. Each participant was informed that the recording was for accuracy in transcription and that all data would be securely stored and anonymized to protect their identities. After each interview, participants were given the opportunity to ask questions about the study and the data handling procedures, ensuring transparency and reinforcing their understanding of privacy protections.

Both semi-structured and virtual interviews come with distinct risks. While semi-structured interviews offer flexibility and depth, they may introduce researcher bias if probing questions inadvertently guide responses, compromising the authenticity of participant insights (Patton, 2015). Additionally, the open-ended format of these interviews can result in varied responses that make analysis more challenging, particularly when participants interpret questions differently (Savin-Baden, 2013). The digital interview format can also reduce rapport and nonverbal communication cues, which may make participants feel less connected and less open or reflective in their responses (Seitz, 2016). Digital platforms are also susceptible to technical issues, such as connectivity problems or audio disruptions, which can interfere with the interview flow and compromise data quality (Archibald et al., 2019). To mitigate these risks, attention was paid to ensuring precise, consistent phrasing of interview questions and maintaining neutrality in follow-up questions. The use of video helped retain some level of nonverbal communication to build rapport.

A detailed summary of each participant's background, including their assigned respondent code, regional unit code, current position, and the duration of each

interview, is presented in Table 1**.** This table illustrates the diversity of roles and regional perspectives represented in the study, reflecting the variety of insights gathered across different organizational levels. The participants' backgrounds, spanning positions such as Digital Project Manager, Strategy and Policy Advisor, and Strategy Advisor Leading AI Integration, ensured that a wide array of perspectives on AI strategy and implementation within a decentralized setting was captured. The interview durations, averaging 41 minutes, allowed for an in-depth exploration of each participant's experience and their particular challenges in their respective roles.

Table 1: Respondent Overview

Respondent Code	Regional Water Management Code	Current Position	Interview Duration (minutes)
R1	W1	Digital Project Manager	42
R2	W2	Innovation Lead	38
R3	W2	IT Manager and Chief Information Officer (CIO)	38
R4	W3	Strategic Architect	38
R5	W4	Water Management Program Lead	30
R6	W5	Water Management Program Lead	48
R7	W6	Senior Digital Strategy Advisor and Secondary CISO	37
R8	W7	Strategy and Policy Advisor	47
R9	W7	Strategy and Policy Advisor	47
R10	W8	Digital Transformation Strategy Lead	50
R11	W9	IT Manager and Chief Information Officer (CIO)	49
R12	W10	Strategy Advisor Leading AI Integration	47
R13	W11	Innovation and Transformation Coordinator	40

R14	W11	Knowledge and Connections Facilitator	40

3.4. Data Analysis

This study's qualitative data analysis used thematic analysis, a widely used method for identifying, analyzing, and reporting patterns within qualitative data. Thematic analysis is particularly suitable for this research, as it provides a flexible yet rigorous approach for interpreting complex and context-specific insights into decentralized AI strategy (Braun & Clarke, 2006). This process moves beyond merely summarizing responses, seeking to capture core themes and meanings related to the strategic and operational challenges of AI implementation within regional water management authorities. The thematic analysis in this study followed the six-phase approach outlined by Braun & Clarke (2006), which began with data familiarization. Each interview transcript was reviewed multiple times to immerse in the content and take initial notes on recurring ideas or significant insights. This initial familiarization phase helped ground the analysis by capturing first impressions of participants' views, an essential step for ensuring that subsequent coding accurately reflected participants' language and concepts (Braun & Clarke, 2006).

The process continued with the generation of initial codes, as per Braun & Clarke (2006) framework. This open coding step identified key phrases, concepts, or topics, preserving the richness and contextual detail of the data. By focusing on participants' words and meanings, this phase ensured the analysis was rooted in the original data. As Gioia et al. (2013) recommend, avoiding premature categorization at this stage allowed themes to emerge organically, maintaining qualitative rigor. Following the initial coding, the analysis searched for themes by exploring relationships among the codes. These were grouped into broader thematic categories that reflected consistent patterns within the data, aligning with axial coding practices (Braun & Clarke, 2006; Gioia et al., 2013). This iterative process was crucial for refining themes and ensuring they addressed the research questions effectively.

A comprehensive review followed, establishing first-order codes and higher-level themes to confirm coherence and accuracy within each thematic category. This review involved comparing each theme with the raw data to ensure it accurately represented participants' experiences. Each theme was given a concise, descriptive name that captured its essence, adhering to Braun & Clarke (2006) approach, which made the thematic structure accessible and meaningful. Themes were further refined and named, focusing on identifying overarching "second-order" themes that represented broader conceptual patterns. This phase added analytical depth by organizing themes into theoretical dimensions, highlighting links between regional autonomy, AI strategy, and operational complexities unique to decentralized structures (Gioia et al., 2013).

The final phase of the analysis involved presenting the findings in a structured narrative, where second-order themes and higher-level dimensions were illustrated with direct participant quotations. This narrative approach ensured that the themes were both comprehensive and data-driven, clearly demonstrating their relevance to the broader research questions (Braun & Clarke, 2006). This method provided an in-depth, organized account of participants' perspectives, enabling an understanding of the nuanced dynamics involved in AI strategy within decentralized settings.

4. Results

This chapter presents the findings from interviews conducted with representatives from decentralized Regional Water Management Authorities in the Netherlands. The aim is to explore how an organizational AI strategy can create synergies while maintaining the flexibility required to address diverse local needs, directly addressing the central research question. Using thematic analysis guided by the Gioia method, three aggregate dimensions were identified, each reflecting a key area where centralized coordination interacts with local adaptation (Gioia et al., 2013).

The first dimension, Balancing Autonomy and Centralization, examines the tension between achieving alignment with a centralized AI strategy and allowing the flexibility necessary for local adaptation. The second dimension, Leveraging Knowledge and Resources, explores how external expertise and internal capabilities are integrated to support effective AI implementation. The third dimension, Enhancing Collaboration and Integration, highlights how resource pooling and cross-regional collaboration enable efficiencies while ensuring responsiveness to region-specific needs.

Each dimension is discussed through first-order concepts and second-order themes, providing insights into the mechanisms Regional Water Management Authorities use to navigate the challenges of implementing centralized AI strategies in decentralized contexts. By structuring the findings around these dimensions, the chapter provides a comprehensive overview of the key factors influencing the balance between central oversight and local flexibility, setting the foundation for deeper analysis in the following sections.

4.1. Aggregate Dimension 1: Balancing Autonomy and Centralization

4.1.1. Overview of the Aggregate Dimension

Integrating an organizational AI strategy in decentralized units presents a critical challenge: balancing the centralized oversight necessary for consistency and standardization with the autonomy required by regional authorities to address local needs effectively. Decentralized units often require flexibility to adapt AI solutions to region-specific conditions, such as environmental regulations and infrastructure capabilities. However, centralization is vital to ensure alignment with broader organizational objectives and to streamline resource usage.

The interview insights highlight this tension, revealing how Regional Water Management Authorities navigate these dynamics. Successful AI strategies hinge on the ability to create synergies between central coordination and local adaptation, enabling decentralized units to innovate while contributing to organizational goals. This

directly addresses the research question by identifying how synergies can emerge from balancing these competing priorities.

4.1.2. Evidence from Interviews

Figure 2 shows how the first-order concepts from the interviews are organized into second-order themes under the aggregate dimension of Balancing Autonomy and Centralization. The dimension encompasses three key themes: Autonomy in Tech Adoption, Governance and Local Adaptation, and Balancing Local and Central Needs. These themes summarize the mechanisms through which Regional Water Management Authorities manage the interaction between central AI strategies and regional flexibility. Other supporting quotes for this second-order theme can be found in Appendix C.

The sections below provide a detailed discussion of each second-order theme, supported by evidence from interviews, demonstrating how decentralized organizations can effectively integrate AI strategies while maintaining the flexibility required for localized applications.

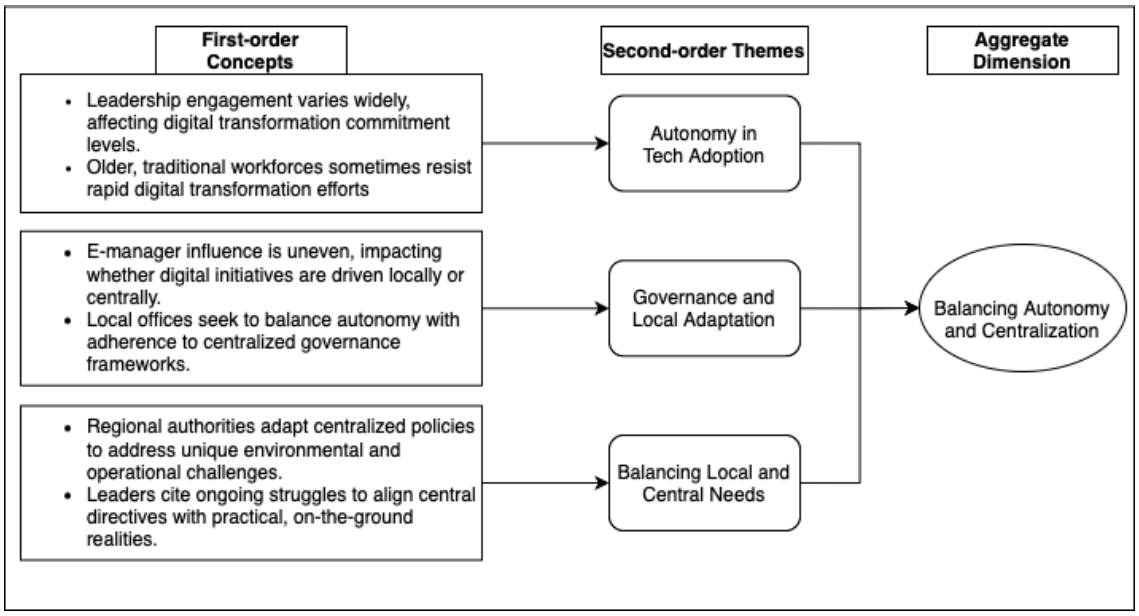

Figure 2. Balancing Autonomy and Centralization

4.1.2.1. Autonomy in Tech Adoption

Adopting AI technologies across Regional Water Management Authorities varies significantly due to regional strategies and leadership engagement differences. As one respondent stated, *"Not all Regional Water Management Authorities have the same strategy, implementation, or commitment from their leadership toward digital transformation." (R1).* This divergence in leadership commitment has created varying degrees of autonomy in embracing technologies like AI tools. Younger employees, more accustomed to working with advanced technologies, show greater enthusiasm

for adopting AI tools. *"We see enthusiasm among younger employees who are already familiar with tools like Copilot, but there's hesitation from others,"* explained another interviewee (R4). However, this enthusiasm is not always matched by older generations, who exhibit a degree of resistance. *"The older generation worries that AI will make their jobs redundant. This is a significant cultural shift we need to address." (R2).*

Furthermore, the cautious approach of many staff members influences the pace of AI adoption. *"Some staff members resist change, particularly those who have worked the same way for decades. This is a significant barrier to implementing AI,"* observed one participant *(R6)*. These insights illustrate how autonomy in AI adoption is closely linked to generational dynamics, organizational culture, and leadership vision.

4.1.2.2. Governance and Local Adaptation

The governance structures across Regional Water Management Authorities vary widely, influencing the degree to which centralized policies are adapted to local contexts. *"There are several Regional Water Management Authorities that are not engaged in this. This is also linked to the positioning of the e-managers,"* (R1) highlights how the role of e-managers significantly shapes the implementation of central strategies. For some regions, the e-manager is part of the executive team, actively leading change and ensuring alignment with local priorities. As one interviewee stated, *"For us, the e-manager is part of the executive team, meaning they oversee both the people and the process changes."* (R1)

However, this adaptation process is not uniform. *"Some Regional Water Management Authorities prefer to observe how others approach things before choosing a strategy themselves"* (R1), illustrating a cautious approach to strategy adoption. The Central Hub, which aggregates knowledge and sets guidelines, is instrumental but not authoritative. *"The Central Hub's role is to aggregate knowledge and set guidelines, not to enforce specific strategies across Regional Water Management Authorities,"* (R4) shared one respondent, emphasizing the balance between providing support and maintaining regional autonomy.

The need for customization is echoed across multiple interviews. While centralized frameworks and tools are valuable, they require significant tailoring to address unique regional challenges. *"The Central Hub provides shared frameworks, but we still need to customize them to align with the challenges of our region,"* (R6) stated one participant. Another emphasized, *"Standardized tools provided by The Central Hub often need significant modifications to fit our unique challenges, such as aging infrastructure."*(R10)**.**

4.1.2.3. Balancing Local and Central Needs

The tension between centralized frameworks and regional priorities creates both challenges and opportunities for Regional Water Management Authorities. As one respondent observed, *"There are differences in how Regional Water Management Authorities implement strategies, depending on whether they focus more on central governance or local priorities."* (R1). This reflects the ongoing struggle to balance overarching policies and operational realities.

Some regions desire unified policies while retaining flexibility for local execution. *“We take the broad guidelines and make adjustments, so they’re more practical for our specific environmental context,”* (R6) said one participant. Similarly, the need for flexibility in dealing with regional variations is crucial. *"It’s important to have centralized frameworks, but local offices need the flexibility to deal with regional differences in environmental and legal issues,"* (R1) highlighted another.

Collaboration is a recurring theme in bridging the gap between local needs and central strategies. *"Cross-regional collaboration could reduce redundancy, especially when multiple Regional Water Management Authorities work on similar AI tools,"* (R10) noted one interviewee, underscoring the potential of cooperation to optimize resources. However, participants also acknowledge that central support must not stifle regional innovation. *"The Central Hub should focus on setting overarching policies but not interfere with how Regional Water Management Authorities operate day-to-day,"* (R2) explained another respondent.

Pilots and small-scale initiatives are often employed to manage this tension, allowing regions to experiment and scale solutions appropriately. *"We focus on small pilots to ensure lessons learned are shared and scaled appropriately across Regional Water Management Authorities,"* (R12) said one participant.

4.1.3. Conclusion: Balancing Autonomy and Centralization

The dimension of Balancing Autonomy and Centralization addresses the challenge of integrating centralized AI strategies with the flexibility required for regional adaptation. While centralized coordination ensures alignment, consistency, and resource efficiency, decentralized units actively address the tension by employing practical mechanisms such as leadership alignment, governance customization, and pilot projects. These mechanisms empower regions to tailor AI tools to local environmental, operational, and legal needs while remaining aligned with organizational priorities.

The findings emphasize that this balance is achieved through a dynamic process of iterative adjustments rather than rigid divisions of responsibility. Collaborative actions, such as cross-regional cooperation and adaptive governance structures, enable decentralized units to innovate effectively. These approaches highlight how

organizations can reconcile centralized oversight with local flexibility to create synergies.

4.2. Aggregate Dimension 2: Leveraging Knowledge and Resources

4.2.1. Overview of the Aggregate Dimension

A key challenge identified in the interviews is how Regional Water Management Authorities leverage external expertise while building internal capabilities to support digital transformation effectively. External partnerships with consultants, universities, and technology vendors provide critical insights and frameworks, yet these need to be adapted to address local operational realities and levels of digital maturity. Striking a balance between utilizing outside-in knowledge and developing internal spanning capabilities is crucial to ensuring that external insights enhance rather than disrupt local objectives. This dynamic aligns directly with the research question, highlighting how an organizational AI strategy can integrate diverse capabilities while maintaining flexibility across decentralized units.

4.2.2. Evidence from Interviews

For Aggregate Dimension 2: Leveraging Knowledge and Resources, Figure 3 illustrates how Regional Water Management Authorities manage the integration of external expertise and internal resources. The dimension encompasses three second-order themes: External Expertise, Digital Readiness, and Customizing Standards. These themes capture the mechanisms through which authorities engage with external partnerships and adapt frameworks to meet local needs effectively.

The sections below provide a detailed discussion of each second-order theme, supported by interview evidence, demonstrating how authorities balance external knowledge with internal capabilities to enhance digital transformation. Other supporting quotes for these themes can be found in Appendix C.

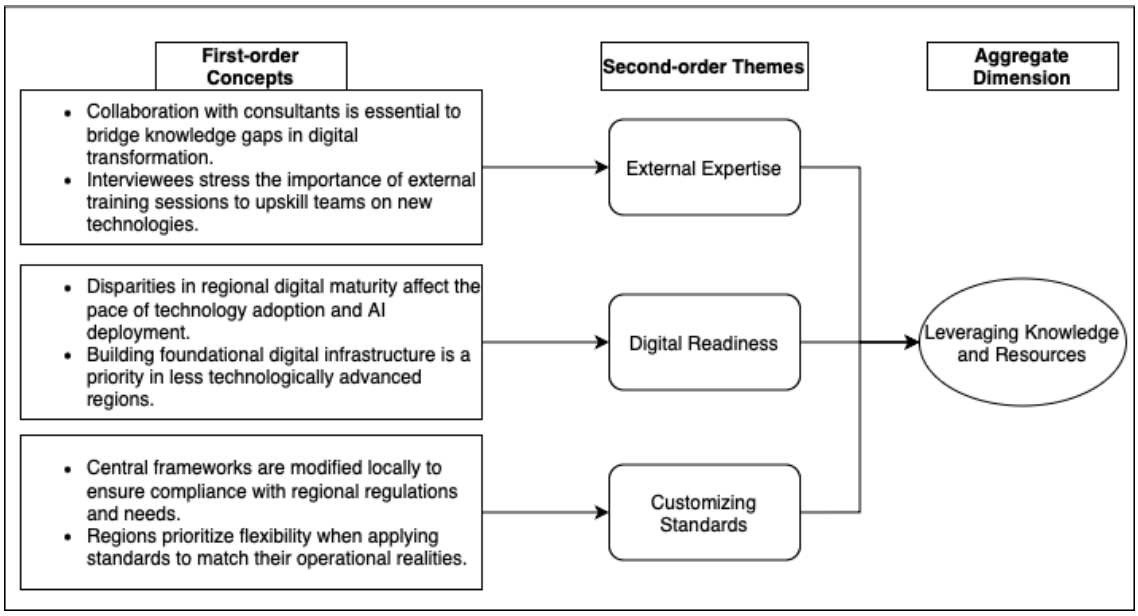

Figure 3. Leveraging Knowledge and Resources

4.2.2.1. External Expertise

Regional Water Management Authorities rely heavily on external partnerships to bridge knowledge gaps and support their digital transformation efforts. As one interviewee noted, *"We often rely on external consultants to help bridge the gap in specialized IT knowledge during transformation projects."* (R11) These consultants not only bring in expertise but also accelerate the setup of critical infrastructure. *"The involvement of consultants accelerates the setup of digital infrastructure, helping us avoid common pitfalls,"* (R4) explained one respondent. Training programs offered by external providers also play a pivotal role in equipping staff with the skills needed to implement AI effectively. *"Training programs led by external providers have helped our staff better understand how to implement AI in their workflows,"* (R12) said another participant.

Additionally, innovation programs and collaborations with universities contribute to exploring new possibilities for AI in water management. *"Our innovation programs collaborate with universities to explore how AI can improve water management processes."* (R13/R14) Technology vendors also provide valuable insights into available tools and how they can be aligned with organizational needs. *"Workshops by technology vendors have shown us what tools are available and how they can align with our needs,"* (R5) shared one participant.

4.2.2.2. Digital Readiness

Digital readiness varies significantly among Regional Water Management Authorities, affecting their ability to adopt and implement advanced technologies. *"The readiness gap between Regional Water Management Authorities is significant, with some having advanced digital infrastructure while others are still building basic capabilities,"* (R11) said one respondent. While some regions are focused on cutting-edge AI

experimentation, others are still working on foundational issues like organizing their data. *"Our focus right now is on foundational issues like organizing our data and ensuring it's ready for AI applications in the future."* (R12)

Building IT systems and governance structures is a critical priority for many regions to enable future advancements. *"Our current efforts focus on building data governance structures to ensure we can deploy future technologies effectively,"* (R6) shared one interviewee. This gap in digital maturity impacts adopting tools like predictive analytics and cross-regional AI applications. *"A lack of consistent IT systems across regions limits our ability to implement cross-regional AI tools."* (R3).

4.2.2.3. Customizing Standards

Customizing centralized frameworks is critical for aligning with the diverse needs and operational realities of Regional Water Management Authorities. While centralized frameworks provide essential guidance, they often require adjustments to meet regional compliance and specific conditions. One interviewee shared, *"The Central Hub provides frameworks, but we often have to adjust them to meet our regional compliance and operational needs."* (R11). These adjustments are vital when dealing with unique local challenges, such as climate conditions. *"We prioritize flexibility in applying national standards to fit the unique challenges we face, such as local climate conditions,"* (R12) explained another.

This need for customization extends to ethical and security frameworks as well. Centralized protocols often conflict with local technological or operational limitations. *"Adopting centralized AI ethics guidelines requires adjustments to reflect specific regional applications and sensitivities,"* (R13/R14) noted one respondent.

Smaller Regional Water Management Authorities often need help fully implementing standardized frameworks due to limited capacity and resources. *"Standardized frameworks for AI deployment are useful, but smaller Regional Water Management Authorities often lack the capacity to fully implement them without adjustments,"* (R9) remarked one participant. Furthermore, critical response protocols, such as those for floods, must align with central guidelines while accommodating regional risks. **"***Some regional standards, like flood response protocols, must align with central guidelines while accounting for local risks,"* (R1) added another.

4.2.3. Conclusion: Leveraging Knowledge and Resources

The Leveraging Knowledge and Resources dimension focuses on how Regional Water Management Authorities integrate external expertise with internal capabilities to support effective digital transformation. External partnerships provide critical knowledge and tools, while regional authorities actively address the challenges of

adaptation by selectively engaging external expertise, enhancing digital readiness, and tailoring centralized frameworks to regional contexts.

By building foundational capabilities and ensuring alignment between external insights and local needs, authorities successfully bridge the gap between outside-in knowledge and internal operational realities. These mechanisms demonstrate how decentralized organizations can effectively leverage external resources to achieve synergies while maintaining flexibility, directly addressing the research question.

4.3. Aggregate Dimension 3: Enhancing Collaboration and Integration

4.3.1. Overview of the Aggregate Dimension

The third aggregate dimension, Enhancing Collaboration and Integration, explores how Regional Water Management Authorities balance centralized resource sharing with the flexibility to address region-specific needs. Centralized systems and pooled budgets improve access to advanced technologies, enable cost-sharing, and streamline operations, benefiting smaller authorities. However, local adaptation is often necessary to align these shared systems with diverse operational, environmental, and regulatory contexts. This dimension directly supports the research question by illustrating how collaborative mechanisms enable decentralized units to integrate AI strategies effectively while maintaining flexibility.

4.3.2. Evidence from Interviews

Figure 4 illustrates how the first-order concepts are grouped into second-order themes under Enhancing Collaboration and Integration. The dimension includes three second-order themes: Shared Systems, Local Use, Resource Integration, and Standardization Efforts vs. Customization Needs. These themes highlight the mechanisms Regional Water Management Authorities use to achieve collective efficiency through collaboration while addressing the unique demands of their regions. Other supporting quotes for these themes can be found in Appendix C.

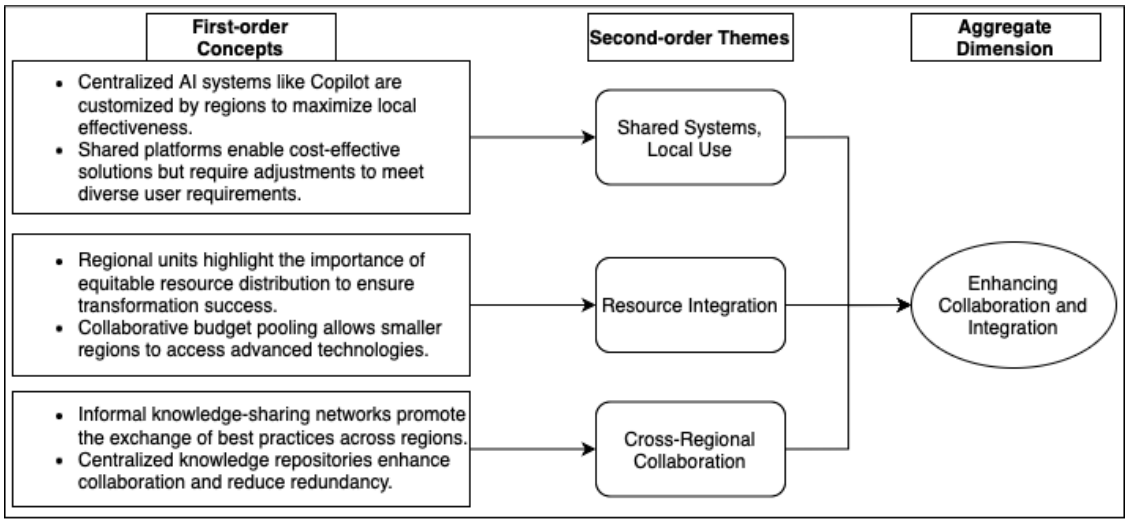

Figure 4. Enhancing Collaboration and Integration

4.3.2.1. Shared Systems, Local Use

Centralized AI systems such as Copilot are essential for fostering collaboration across regions but often require localized adjustments to ensure their effectiveness. *"Centralized AI tools like Copilot are useful but must be adjusted locally to align with operational workflows and regulatory needs,"* (R11) explained one respondent. Shared platforms, while cost-effective, also need refinement to accommodate diverse regional requirements. *"Shared platforms for AI, like Copilot, provide cost-effective solutions but require adjustments to meet diverse user requirements."* (R12)

The usability of centralized systems relies heavily on input from local teams. *"The centralized data repository simplifies access for all regions but requires input from local teams to ensure usability,"* (R5) noted another participant. Standardization is key, but flexibility remains critical. *"AI tools like predictive maintenance systems must be standardized centrally while allowing regional teams to refine them based on local needs."* (R9). Similarly, shared security protocols must be adaptable to infrastructure differences across Regional Water Management Authorities. *"We ensure shared security protocols are adaptable to the infrastructure differences between Regional Water Management Authorities."* (R7).

4.3.2.2. Resource Integration

Pooling resources and budgets enables Regional Water Management Authorities to access advanced technologies that might otherwise be out of reach. *"Collaborative budget pooling allows smaller Regional Water Management Authorities to access advanced technologies like AI," (R13/R14)* remarked one interviewee. Equitable distribution of funds from The Central Hub ensures participation across all regions. *"Equitable distribution of funds from The Central Hub ensures all regions can participate in transformation efforts."* (R6)

Shared budgets not only reduce costs but also streamline the development and deployment of IT systems. *"Instead of each Regional Water Management Authorities creating their own IT system, we've pooled budgets to develop a shared one, cutting costs and saving time,"* (R6) explained one participant. Furthermore, collective funding reduces the financial burden on individual Regional Water Management Authorities and accelerates implementation timelines. *"Funding AI projects collectively reduces the financial burden on individual Regional Water Management Authorities and accelerates implementation."* (R3).

4.3.2.3. Standardization Efforts vs. Customization Needs

Cross-regional collaboration facilitates knowledge exchange, reducing redundancy and improving project success rates. *"Cross-regional knowledge-sharing programs have been instrumental in spreading best practices for AI deployment,"* (R1) noted one respondent. A centralized repository for documenting lessons learned further aids in refining AI tools and approaches. *"We use a centralized repository to document lessons learned from each region, reducing redundancy in AI tool development."* (R8/R9).

Regular cross-regional meetings and workshops are critical in fostering alignment and collaboration. *"Regular cross-regional meetings allow us to coordinate efforts, ensuring consistency while addressing unique regional challenges,"* (R10) shared one interviewee. These forums also allow regions to adapt shared solutions to their specific needs. "*We encourage regular cross-regional dialogue to align priorities and adapt shared solutions to unique regional challenges."* (R7).

4.3.3. Conclusion: Enhancing Collaboration and Integration

The dimension of Enhancing Collaboration and Integration highlights how Regional Water Management Authorities foster synergies through shared systems, resource pooling, and cross-regional collaboration. These mechanisms enable authorities to reduce costs, improve access to advanced technologies, and streamline operations. However, their success hinges on adapting centralized frameworks to local contexts.

Practical solutions include equitable resource distribution, flexible implementation of shared systems, and collaborative communications to align centralized strategies with regional needs. These approaches address the tension between collective efficiency and local responsiveness, demonstrating how decentralized organizations can maintain flexibility while achieving organizational goals.

5. Discussion

This chapter discusses the study's findings, beginning with 5.1 Key Findings, which addresses the sub-research questions and main research question on effective AI strategy in decentralized organizations. 5.2 Theoretical Implications explores the study's contributions to existing literature, while 5.3 Practical Implications outlines actionable insights for implementing AI across diverse organizational units. Lastly, 5.4 Limitations and Future Research Directions considers study constraints and proposes areas for further investigation to expand upon these insights in varied contexts.

5.1. Key Findings

This chapter synthesizes the primary findings related to the main research question: *How can an organizational AI strategy help create complementarities while allowing flexibility in decentralized organizations?* The findings are structured around two key sub-questions, each addressing critical elements of an AI strategy's design and implementation within decentralized frameworks, specifically for regional water management authorities.

5.1.1. Essential Components: A System of Interdependent Elements

The effectiveness of an AI strategy in decentralized organizations depends on more than isolated components. It relies on a system of interconnected elements working in harmony. These components address the central challenge of balancing strategic coherence with the operational flexibility needed across diverse units. By combining centralized governance, collaborative mechanisms, adaptable AI systems, and continuous feedback, organizations can create a robust framework that fosters both alignment and innovation. This section explores how these elements interrelate and contribute to the success of AI strategies in decentralized contexts.

5.1.1.1. Centralized Governance: The Framework That Grounds Everything

Centralized governance lays the foundation for any successful AI strategy in decentralized organizations. It provides a unified structure for data management, ethical compliance, and resource sharing, ensuring all units operate consistently and accountable. However, governance in this context is not about rigid control, it is a framework that supports and empowers local innovation. For example, shared data lakes ensure all units can access standardized, high-quality data. This prevents discrepancies and enables decentralized teams to tailor AI solutions to their specific needs without compromising organizational goals. Similarly, ethical governance frameworks establish consistent accountability and regulatory compliance principles

while allowing decentralized units to adapt these principles to their local legal and cultural environments.

Governance also strengthens inter-unit collaboration. Establishing clear standards and shared resources creates a common ground for decentralized teams to innovate while adhering to organizational priorities. With this foundation, decentralized efforts avoid becoming fragmented or misaligned with broader objectives.

5.1.1.2. Collaborative Mechanisms: Turning Alignment Into Action

While governance sets the foundation, collaboration transforms strategic alignment into practical outcomes. Collaborative mechanisms, such as cross-functional workshops, shared platforms, and inter-unit knowledge-sharing sessions, are essential for ensuring the AI strategy is cohesive and adaptable. Workshops, for instance, allow teams to co-develop solutions, adapting central policies to fit local realities. This collaborative process not only reduces silos but also fosters a sense of shared purpose. Decentralized units are no longer implementing directives in isolation; instead, they actively shape the organization's AI strategy.

Collaboration also ensures that lessons learned in one region are shared across the organization. When decentralized teams openly discuss their successes and challenges, they help create a culture of collective problem-solving. These insights often inform central strategies, making them more reflective of on-the-ground realities. The relationship between governance and collaboration is particularly evident here. Governance provides the frameworks and tools that make collaboration possible, while collaborative efforts refine and adapt those frameworks for practical use.

5.1.1.3. Adaptable AI Systems: Customization Without Chaos

Adaptable AI systems are the tools that make an organization's strategy operational. These systems allow decentralized units to modify AI models and algorithms to suit their unique environments while aligning with organizational standards. This balance between customization and consistency is critical in decentralized organizations where operational needs vary widely. For instance, predictive maintenance models can be tailored to account for differences in regional infrastructure while adhering to the central organization's technical guidelines. These localized adaptations enhance the relevance and effectiveness of AI applications without compromising the quality or reliability of the broader AI strategy.

Central governance, which provides the resources and standards needed for customization, makes these systems adaptable. At the same time, decentralized units play a key role in refining them through real-world application, creating a feedback loop that keeps them dynamic and relevant.

5.1.1.4. Continuous Feedback: The Engine of Improvement

Continuous feedback mechanisms are what keep the strategy evolving. They allow decentralized units to refine AI applications based on real-time performance data while informing central strategies about on-the-ground challenges and successes. This two-way flow of information ensures that local and central teams stay aligned as the strategy evolves. For example, decentralized units can use automated feedback systems to adjust algorithms in response to changing conditions. These real-time refinements ensure that AI applications remain effective and relevant in local contexts. At the same time, insights generated through these refinements feed back into the central strategy, helping the organization improve its overall approach. This iterative process creates a dynamic and resilient system. The organization can stay ahead of challenges by continuously learning and adapting, ensuring its AI strategy remains effective in a rapidly changing environment.

5.1.1.5. Interdependence of Components

These components do not function in isolation. Centralized governance lays the foundation for consistency and accountability, enabling collaborative mechanisms to thrive. Collaboration, in turn, enhances the practical application of adaptable AI systems, while continuous feedback ensures that these systems and strategies remain relevant and effective. Together, these elements create a system where strategic coherence and operational flexibility are not opposing forces but complementary goals.

This interconnectedness is what makes the AI strategy work. Governance sets the rules, collaboration drives innovation, adaptable systems make solutions practical, and feedback ensures ongoing improvement. Each component reinforces the others, creating a cohesive and adaptive approach to AI deployment in decentralized organizations.

5.1.2. Managerial Actions: Operationalizing AI Strategy

The successful implementation of an AI strategy in decentralized organizations relies heavily on practical managerial actions that bridge the gap between centralized goals and local needs. Managers play a pivotal role in translating the strategy into actionable steps, fostering alignment while empowering decentralized units to innovate within their unique contexts. This section explores essential managerial actions that operationalize the strategy, focusing on their interdependence and impact.

5.1.2.1. Facilitating Collaboration: Aligning Efforts Through Knowledge Sharing

One of the most effective managerial actions is fostering collaboration through cross-functional workshops and knowledge-sharing sessions. These initiatives create opportunities for decentralized units to engage with central policies and frameworks,

ensuring that strategies are understood and adapted to meet local needs. For example, workshops encourage the co-creation of solutions by enabling teams from different regions to share experiences, discuss challenges, and exchange best practices. This process helps units align their efforts with central goals while tailoring them to their specific operational realities. The collaborative approach also builds trust and encourages decentralized teams to take ownership of their role in the organization's broader AI strategy.

5.1.2.2. Pooling Resources: Leveraging Shared Investments

Pooling resources is another critical managerial action that enables decentralized units to overcome disparities in technical and financial capacities. Shared investments in data infrastructure, AI tools, and training initiatives ensure that even smaller or less technologically advanced units have access to the capabilities they need to succeed. For instance, shared data lakes and centralized AI tools provide all units with the same foundational resources, reducing duplication of effort and cost inefficiencies. This approach levels the playing field while allowing decentralized units to apply these resources flexibly according to their local priorities.

5.1.2.3. Adapting Central Frameworks: Balancing Consistency and Flexibility

Managers play a vital role in interpreting and adapting central frameworks to fit decentralized units' diverse regulatory, cultural, and operational contexts. This selective application of central guidelines ensures that local teams can comply with organizational standards without compromising their responsiveness to unique conditions. For example, ethical guidelines set by the central organization are adapted to meet local legal requirements and cultural expectations. Similarly, technical frameworks, such as those for predictive analytics, are adjusted to reflect data availability and infrastructure variations.

5.1.2.4. Encouraging Targeted Knowledge Sharing: Focusing on Relevance

Strategic engagement action is strategic engagement in external knowledge-sharing initiatives. Managers selectively prioritize partnerships, training programs, and industry collaborations that address their units' specific needs, ensuring that resources are allocated effectively. For instance, partnerships with universities or technology vendors allow decentralized units to stay informed about the latest advancements in AI. Managers focus on initiatives that directly contribute to their units' objectives, ensuring alignment with both local priorities and the organization's overall strategy.

5.1.2.5. Promoting a Culture of Continuous Improvement: Sustaining the Strategy

Finally, managers cultivate a culture of continuous improvement by investing in digital literacy programs, change management efforts, and iterative learning processes. This proactive approach ensures that employees can adapt AI tools to evolving conditions, fostering innovation and resilience. For example, managers encourage decentralized teams to experiment with AI applications, refine processes based on feedback, and share their insights with the broader organization. These efforts create a dynamic environment where the AI strategy evolves in response to local and global challenges.

5.1.2.6. How Managerial Actions Work Together

These managerial actions are not standalone; they are deeply interconnected. Collaboration fosters alignment, resource pooling provides equitable access to tools, framework adaptation ensures local relevance, targeted knowledge sharing promotes innovation, and continuous improvement sustains the strategy. Together, they create a system in which decentralized units are empowered to innovate while maintaining alignment with the organization's strategic goals.

5.1.3. Creating Complementarities: Structured Flexibility in Practice

A key challenge in decentralized organizations is achieving complementarities and synergies between units that enhance overall effectiveness while preserving the flexibility required for local responsiveness. The findings reveal that a successful AI strategy balances these elements and leverages their interplay to create a dynamic and adaptable system. This section explores how alignment and innovation are fostered by hybrid governance, resource pooling, dual capabilities, adaptive AI systems, and continuous learning.

5.1.3.1. Hybrid Governance: The Balance of Unity and Autonomy

At the heart of creating complementarities is a hybrid governance model that blends central oversight with local autonomy. The central organization provides a unified ethical and operational baseline while allowing decentralized units to adapt policies to their specific contexts. This model creates space for units to innovate without veering off course. For example, while the central body defines AI ethics and regulatory standards, regional units tailor these guidelines to meet local compliance requirements and cultural norms. This flexibility ensures that all units contribute to a shared organizational identity while addressing their unique operational challenges.

5.1.3.2. Resource Pooling: Building Collective Strength

Complementarities are also driven by resource pooling, which enables decentralized units to share advanced tools, data, and infrastructure that would otherwise be cost-

prohibitive for individual units. This approach not only reduces duplication of effort but also fosters a sense of collective responsibility. For instance, shared data lakes allow units to collaborate on predictive models, creating efficiencies that benefit the entire organization. However, this pooling doesn't come at the expense of local needs. Units retain the ability to customize these shared resources for their specific purposes. Importantly, resource pooling levels the playing field, ensuring that smaller or less technologically advanced units can access cutting-edge AI capabilities. By addressing disparities across units, it strengthens the organization's overall capacity for innovation and adaptability.

5.1.3.3. Inside-Out and Outside-In Capabilities: Linking Internal Strengths and External Opportunities

Combining inside-out and outside-in perspectives, a dual capability approach further enhances complementarities. Inside-out capabilities leverage the organization's internal strengths, such as centralized AI models and shared expertise. In contrast, outside-in capabilities focus on incorporating external insights, such as market trends and regional demands. For example, centralized teams may develop robust AI models using proprietary data, while decentralized units refine these models with local knowledge and feedback. This interplay ensures that AI tools remain relevant and effective in diverse environments. The dual capability approach also strengthens innovation. Units closely connected to their local environments can bring external insights to the organization, enriching its central strategy and creating a feedback loop that benefits all.

5.1.3.4. Adaptive AI Systems: Flexibility That Enhances Alignment

Adaptive AI systems are another key driver of complementarities. These systems are designed to be customizable, allowing decentralized units to adjust AI tools to meet local needs while maintaining alignment with central standards. This adaptability ensures that units can respond quickly to specific challenges without undermining the consistency of the broader strategy. For instance, one unit may use an AI model to optimize water management in an urban setting, while another applies the same model to a rural environment. Both units achieve optimal results by tailoring parameters and algorithms while benefiting from a shared technological foundation. Adaptability is reinforced by continuous learning mechanisms, which enable AI systems to evolve based on feedback from local applications. This ensures that models stay relevant and effective over time, strengthening organizational complementarities.

5.1.3.5. Continuous Learning: Sustaining Complementarities Over Time

Complementarities are not static; they need to be sustained through continuous learning and feedback. By encouraging decentralized units to share insights and lessons learned, organizations can ensure that successful practices are scaled and refined across the system. For example, local teams might identify new ways to optimize AI applications based on unique regional conditions. These insights, when

shared with the central organization and other units, contribute to the overall improvement of the strategy. This culture of iterative learning fosters resilience and adaptability, ensuring that complementarities evolve in step with changing needs.

5.1.3.6. How Complementarities Drive Success

The interaction of hybrid governance, resource pooling, dual capabilities, adaptive AI systems, and continuous learning creates a system of structured flexibility. Each component reinforces the others: governance provides the foundation, resource pooling builds collective capacity, dual capabilities link internal strengths with external opportunities, adaptive systems ensure responsiveness and continuous learning sustains the entire framework. These elements enable decentralized units to innovate locally while contributing to the organization's overarching goals. This structured flexibility ensures that complementarities drive alignment and sustained innovation and effectiveness.

5.2. Theoretical Implications

The theoretical implications of this study lie in its contributions to the existing literature on AI integration within decentralized organizations, specifically addressing how AI strategies can be designed to balance centralization and decentralization. This research extends existing frameworks by providing a nuanced approach to AI strategy that emphasizes structured flexibility, where centralized resources and governance coexist with unit-level autonomy. By highlighting the dual requirements of strategic coherence and operational flexibility, this study advances theoretical perspectives on digital transformation, governance, and organizational agility, which are increasingly relevant as organizations face complex digitalization challenges across diverse and often geographically dispersed units.

First, this study contributes to the literature on AI governance and strategy in decentralized settings by proposing a hybrid model that allows standardization and local adaptation. Traditional approaches often view centralization and decentralization as competing forces, but this study demonstrates that a structured, hybrid model can enhance the effectiveness of AI strategies in complex organizational contexts. By supporting the idea that centralized AI policies and frameworks can be adapted to fit the operational and cultural needs of decentralized units, this research aligns with, yet builds upon, theories of flexible governance (Papadopoulos & Charalabidis, 2021; Weritz et al., 2024). This hybrid governance model not only helps ensure compliance and ethical consistency across units but also promotes a framework for flexibility that is responsive to local conditions, adding to the body of knowledge on adaptive organizational strategies in digital environments.

Second, the study contributes to the literature on resource sharing and capability building in AI. Previous research has primarily focused on the centralized deployment of resources and capabilities, often within homogenous, centrally managed environments. By contrast, this research emphasizes the effectiveness of resource pooling and cross-unit collaboration in decentralized contexts, where units have varied technological needs and resources. The findings suggest that shared investments in data infrastructure, AI tools, and training initiatives can mitigate differences between decentralized units, enabling smaller or less technologically mature units to benefit from advanced AI capabilities (Polyviou & Zamani, 2023). This collaborative resource approach reinforces theories on collective efficiency while extending them to contexts where units operate with high degrees of autonomy, contributing to a deeper understanding of resource dependency and complementarity within complex organizational structures.

In addition, this study contributes to theoretical discussions on organizational agility and adaptability by demonstrating the importance of adaptable AI systems and continuous feedback mechanisms in supporting resilience and responsiveness across decentralized units. Adaptive AI systems that allow local units to tailor AI applications to specific contexts without compromising central standards align with theories on strategic agility and responsiveness (Wang et al., 2023). By empirically validating the need for iterative feedback systems that permit units to adjust AI models based on real-time performance data, the study provides practical insights into how continuous learning mechanisms can strengthen centralized and decentralized aspects of AI strategy. This supports and extends the work of Zheng et al. (2023) on the role of feedback in fostering organizational agility, demonstrating how continuous improvement practices can be integrated effectively across decentralized units to sustain relevance and operational alignment.

Finally, this research addresses a significant gap in complementarity literature, illustrating how AI strategies can enable decentralized units to create synergies without sacrificing local autonomy. The concept of structured flexibility contributes to a broader theoretical understanding of how organizations can simultaneously pursue coherence and adaptability, reconciling the need for unity in AI deployment with the benefits of local innovation. This balance of inside-out and outside-in capabilities supports theories of capability integration, where the organization leverages both its internal strengths and external knowledge to create a dynamic, responsive AI strategy (Weritz et al., 2024). This approach to complementarity within decentralized organizations expands the current literature on AI strategy by showing that AI initiatives can be scaled across heterogeneous units, maximizing organizational cohesion and localized adaptation.

In summary, this study's contributions to the literature include its hybrid governance model, collaborative resource sharing, adaptive capability building, and structured flexibility, enhancing the theoretical understanding of AI integration within decentralized

organizations. By advancing the discourse on how AI strategies can harmonize central oversight with local flexibility, this research provides a foundational framework to guide future studies on AI deployment, governance, and adaptability across complex organizational landscapes.

5.3. Practical Implications

The practical implications of this study offer actionable insights for organizations seeking to implement AI strategies effectively within decentralized structures. By highlighting specific managerial actions, resource-sharing practices, and governance frameworks, this research provides a roadmap for organizations aiming to balance centralized AI oversight with the flexibility necessary for decentralized units to respond to local conditions. These implications are particularly valuable for practitioners in fields such as public sector administration, global corporations, and large-scale service industries where decentralized operations are common.

First, one key practical implication is the need for hybrid governance models that integrate centralized AI policies with adaptive frameworks that local units can customize. Organizations should develop governance structures that define core standards, particularly in data ethics, regulatory compliance, and AI performance, but allow flexibility for decentralized units to tailor applications to meet regional or functional requirements (Papadopoulos & Charalabidis, 2021; Weritz et al., 2024). This approach addresses the inherent tension in decentralized settings, where strict centralization can stifle local innovation, while complete decentralization may lead to inconsistencies. By employing hybrid governance, organizations can achieve the dual objectives of consistency and adaptability, ensuring alignment with overarching goals while giving units the autonomy to meet local needs.

Another significant implication involves resource pooling and shared investments to support technological parity across units. This study underscores that resource-sharing frameworks enable organizations to centralize investments in data infrastructure, computing resources, and AI tools, making these resources accessible across all units. This is particularly beneficial for smaller or less technologically mature units that may otherwise lack the means to fully implement advanced AI systems (Polyviou & Zamani, 2023). For practitioners, this means prioritizing investments that benefit multiple units, such as creating centralized data lakes or shared AI toolkits, which decentralized units can adapt based on specific needs. Centralized resource pools promote operational efficiency and ensure that all units can leverage advanced AI capabilities, contributing to cohesive AI deployment across the organization (Kraus et al., 2022).

Additionally, managerial practices such as organizing cross-functional workshops and selective knowledge-sharing initiatives are essential for practical AI integration. Managers can bridge the gap between central AI strategy and local application by facilitating collaborative workshops that allow units to share best practices, challenges,

and innovations. By creating a regular cadence for such interactions, organizations can prevent silos from forming within decentralized structures and ensure that units learn from each other's experiences (Weritz et al., 2024; Zheng et al., 2023). Selective engagement in external training and partnership programs further supports this by allowing managers to target initiatives that directly align with the needs of specific units, thereby optimizing both cost-effectiveness and relevance. For practitioners, these collaborative and selective knowledge-sharing practices offer a structured approach to building a cohesive AI culture across geographically or functionally diverse units.

A further implication involves promoting adaptive AI systems that allow decentralized units to modify AI applications according to local needs without disrupting central standards. For organizations, this means investing in AI platforms that offer flexibility in algorithm customization, data input variables, and output reporting, enabling units to tailor models based on local data and operational goals (Wang et al., 2023). Practitioners should prioritize adaptable platforms and provide training for units to make adjustments confidently and effectively. This adaptability fosters local innovation and relevance, ensuring that AI applications are both standardized and responsive. It also encourages unit-level accountability in refining AI tools to achieve localized impacts, thus supporting the organization’s strategic coherence (Zheng et al., 2023).

Finally, continuous feedback mechanisms provide decentralized units with the ability to monitor and adjust AI applications in real-time, facilitating ongoing learning and improvement. Organizations should implement automated feedback systems that generate insights on AI performance across units, helping teams identify areas for refinement and recalibration. This approach allows units to remain agile in adapting to changes in market or operational demands, fostering resilience in a dynamic digital environment (Kraus et al., 2022; Weritz et al., 2024). For practitioners, setting up feedback systems, such as performance dashboards and regular assessments, ensures local units can self-correct and evolve AI models independently while aligning with the central strategy. This fosters a culture of continuous improvement and responsiveness, both essential for sustainable success in decentralized AI deployment.

In summary, these practical implications suggest a balanced approach for organizations: employ hybrid governance models, leverage shared resources, foster collaboration through targeted knowledge-sharing initiatives, prioritize adaptable AI systems, and establish feedback mechanisms that empower local units. By adopting these strategies, organizations can realize an AI strategy that maintains alignment with central goals while enabling each unit to innovate and operate autonomously. This structured flexibility is crucial for organizations looking to enhance their digital transformation initiatives, driving both efficiency and competitiveness across decentralized structures.

5.4. Limitations and Future Research Directions

The limitations of this study highlight several areas where future research could further expand our understanding of AI integration in decentralized organizations. First, this study's qualitative design, which relies on interviews and thematic analysis, provides in-depth insights but may lack the generalizability of quantitative approaches. Future research could incorporate quantitative methods, such as surveys across various sectors and geographies, to test the findings on a larger scale and strengthen the external validity of the proposed AI strategy framework. Additionally, this research primarily focused on a specific organizational context, decentralized water management authorities, which may limit the applicability of findings to other industries. Decentralized structures vary widely in autonomy, complexity, and regulatory environment; thus, further studies could explore similar AI strategies in other decentralized industries, such as healthcare, finance, or multinational corporations, to identify potential variations or industry-specific adaptations. Another limitation is that this study did not measure the long-term effectiveness of the proposed hybrid governance and resource-sharing models in supporting both strategic coherence and operational flexibility. Longitudinal studies that track the implementation and outcomes of these strategies over time would be valuable in understanding how decentralized units adapt to changes in technology, organizational goals, or market conditions. Such research could examine how AI strategies evolve and impact organizational resilience and agility in dynamic environments. Lastly, as AI technologies and regulations continue to evolve rapidly, future research should explore the impact of emerging AI technologies, such as generative AI and advanced machine learning algorithms, within decentralized structures. Investigating how new regulatory frameworks influence the balance of central oversight and unit-level autonomy will also be crucial. This research would contribute to developing adaptable AI strategies that are not only effective in current conditions but are also resilient to future technological and regulatory shifts.

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Appendix

A. AI Usage

During the preparation of this work, I used Chat GPT, Grammarly, and Scopus AI to summarize, brainstorm, and rewrite my own ideas and found text. After using this tool/service, I thoroughly reviewed and edited the content as needed, taking full responsibility for the final outcome.

B. Invitation Mail and Interview guide

Subject: Invitation to Participate in an Interview on AI Strategies

Dear [Name],

My name is Wouter Knol, and I am currently conducting my Master's research at the University of Twente. My study focuses on integrating AI strategies within decentralized organizations, specifically in the Netherlands' water management context. I plan to interview multiple regional water management authorities and de central hub for this research.

I received your contact information from Person x at the central hub and would like to invite you to a short interview via Microsoft Teams to hear your experiences and insights on how AI strategies can contribute to collaboration and flexibility within your organization. The interview will take about 30 to 40 minutes.

I hope to schedule the interviews during week 39 or 40. You can select a suitable time using this link: [link]. I will send you a Microsoft Teams link prior to our conversation.

The interview will be recorded for transcription purposes, but the recording will be deleted after finishing my thesis. Your responses will be processed entirely anonymously, and your privacy will be strictly maintained.

Your participation would greatly benefit both my research and your organization by providing a deeper understanding of how AI strategies can be effectively applied across different organizations.

I am truly grateful for your potential participation and look forward to hearing when you are available.

Kind regards,

Wouter Knol
Master's Student in Business Administration
University of Twente

Interview Guide for Employees at (Central Hub)

Introduction:

- Briefly introduce myself and the purpose of the interview.
- Explain the research focus on AI integration strategies within decentralized organizations, particularly in Dutch water organizations.
- Assure the participant of confidentiality and the voluntary nature of their participation.

1. Strategic Coordination and Alignment:

- How does The central hub develop AI strategies to ensure alignment across all Regional water management Authorities?
- What challenges have you faced in balancing centralized AI strategy with the need for local adaptation?
- Can you provide an example of a centralized AI initiative that was effectively aligned with the unique needs of different water authorities?

2. Pooling Resources and Centralized Support:

- What resources (e.g., data, tools, training) are pooled at the central level to support AI initiatives across the Regional water management Authorities?
- How does The central hub determine the allocation of these resources to different decentralized units?
- Are there instances where centrally pooling resources has improved the implementation of AI strategy?

3. Cross-Organizational Collaboration and Knowledge Sharing:

- How do you facilitate cross-organizational collaboration and knowledge sharing related to AI initiatives?
- What mechanisms or tools most effectively promote collaboration between The central hub and the decentralized water authorities?
- Can you share examples of successful knowledge-sharing practices in the context of AI projects?

4. Monitoring and Evaluation of AI Strategies:

- How do you monitor the effectiveness of AI strategies implemented by different water authorities?
- What metrics or indicators are used to evaluate the success of these strategies?
- How is feedback from the decentralized units incorporated into the ongoing development of AI initiatives?

5. Future Directions and Strategic Capabilities:

- What future changes or improvements would you recommend enhancing AI integration across decentralized units?
- How does The central hub plan to build strategic capabilities to support AI initiatives in the future?
- What additional capabilities do you believe are necessary for the successful deployment of AI technologies?

Closing:

- Thank the participant for their time and insights.
- Ask if they have any additional comments or questions.
- Inform them about the next steps and how the information will be used in the research.

Interview Guide for Employees at Decentralized Units

Introduction:

- Briefly introduce myself and the purpose of the interview.
- Explain the research focus on understanding AI integration strategies in decentralized organizations, particularly the Regional water management Authorities.
- Assure the participant of confidentiality and the voluntary nature of their participation.

1. Local Adaptation and Flexibility:

- How do centralized AI orders from The central hub impact your local operations?
- Can you provide examples of how your unit has adapted centralized AI strategies to address local challenges?
- What are the main barriers to implementing these AI strategies at the local level?

2. Autonomy and Resource Utilization:

- How much autonomy do you have in modifying AI tools and initiatives to suit your regional needs?
- Are there specific cases where you needed more flexibility in adapting AI strategies?
- How does your unit utilize resources pooled centrally by The central hub to implement AI effectively?

3. Interaction with The central hub:

- How often do you interact with The central hub regarding AI strategy implementation?
- How effective do you find the current support and communication from The central hub?
- What improvements could be made to enhance coordination between your unit and the central hub?

4. Cross-Functional Collaboration and Knowledge Sharing:

- How do you collaborate with other decentralized units or with The central hub in AI implementation?
- Are there knowledge-sharing platforms or forums that you find particularly useful?
- What additional resources or support would help improve collaboration?
    - Do you use them often?

5. Challenges and Opportunities:

- What are your most significant challenges in integrating AI into your local operations?
- Are there specific opportunities or use cases for AI that are unique to your region?
- What support or resources would be most beneficial to help overcome these challenges?

6. Future Directions and Strategic Capabilities:

- What changes or improvements would you suggest for better AI integration at the local level?
- How do you envision AI impacting your operations in the next few years?
- What role would you like The central hub to play in supporting future AI initiatives?

Closing:

- Thank the participant for their time and insights.
- Ask if they have any additional comments or questions.
- Inform them about the next steps and how the information will be used in the research.

C. Supporting Quotes

Second-order Themes	Quote	Source
Autonomy in Tech Adoption	"Some staff members still prefer printed maps rather than using iPads, reflecting resistance from the older generation."	R5
Autonomy in Tech Adoption	"Digital literacy across staff varies widely, making it difficult to roll out advanced tools like ChatGPT or Copilot effectively."	R13/R14
Autonomy in Tech Adoption	"Digitalization is a priority because our leadership sees its potential to optimize resource management, but not all authorities have this focus"	R4
Autonomy in Tech Adoption	“Our leadership understands that AI is here to stay and wants us to lead the charge in digital transformation, yet not every authority feels this urgency”	R1
Autonomy in Tech Adoption	"Staff are cautious about change, especially those who have been in the same role for decades. It's a challenge to bring everyone on board."	R8/R9
Autonomy in Tech Adoption	"We have early adopters and laggards in our organization, and this split often delays overall adoption of new technologies."	R7
Governance and Local Adaptation	"Collaboration with neighboring Regional Water Management Authorities often arises informally and not through structured channels."	R5
Governance and Local Adaptation	"We look to The Central Hub for collaboration on some AI experiments, but implementation always requires adaptation to our specific needs."	R6
Governance and Local Adaptation	"The Central Hub facilitates certain innovations, but they need to be adapted to match the operational context of each water board."	R8/R9
Governance and Local Adaptation	"The Central Hub is instrumental in providing tools, but these need to be adapted to match the operational realities of each water board."	R11
Balancing Local and Central Needs	"Some Regional Water Management Authorities look to The Central Hub for guidance, but they want the freedom to adapt approaches to their specific needs."	R2/R3
Balancing Local and Central Needs	"Regional Water Management Authorities are all experimenting with AI tools like Copilot, but collaboration could prevent duplication of efforts."	R5
Balancing Local and Central Needs	"When The Central Hub takes too long, we often find faster ways to implement innovative tools by working directly with neighboring regions."	R8/R9
Balancing Local and Central Needs	"Cross-regional projects funded collectively ensure that no single water board bears the full cost of innovation."	R13/R14
External Expertise	*“*We work with partners to develop the Target Operating Model, which provides us with a solid structure to plan our digital projects” *(R6)”*	R6

External Expertise	"Consultants have helped us design AI strategies that fit our specific operational goals and data limitations."	R8/R9
External Expertise	"The involvement of consultants accelerates the setup of digital infrastructure, helping us avoid common pitfalls."	R4
Digital Readiness	“Some of us are fully equipped and ready, while others need more foundational training before diving in”, noted one respondent (R8 R9).	R8/R9
Digital Readiness	"Some Regional Water Management Authorities still struggle with the basics, like data quality and infrastructure, before they can think about advanced tools."	R4
Digital Readiness	"Regions with older systems face significant delays in adopting advanced technologies like predictive analytics."	R2/R3
Customizing Standards	"Shared frameworks are essential, but flexibility is necessary to ensure implementation aligns with regional operational workflows."	R10
Shared Systems, Local Use	‘’Pooling budgets allows us to access tools we wouldn’t otherwise be able to afford individually”	R1
Shared Systems, Local Use	‘’We participate in collective budgeting for digital tools because it’s cost-effective, but we implement these tools in ways that make sense for our specific region”	R10
Shared Systems, Local Use	"Centralized systems simplify access to resources but often don’t align with our local operational needs, creating inefficiencies."	R4
Shared Systems, Local Use	"Shared AI tools like predictive analytics are beneficial but require additional training at the local level to be effective."	R2/R3
Shared Systems, Local Use	"Copilot has great potential, but the rules for using it differ across regions, so we need flexibility in implementation."	R12
Shared Systems, Local Use	"Our shared IT platform is great for collaboration, but certain tools are redundant because of regional differences in workflows."	R11
Resource Integration	"We share technical staff resources across multiple Regional Water Management Authorities to optimize costs and ensure consistent implementation."	R4
Resource Integration	"Pooling resources for joint AI projects allows even smaller Regional Water Management Authorities to implement advanced tools they otherwise couldn’t afford."	R8/R9
Resource Integration	"We create shared training budgets to ensure all employees, regardless of the region, have access to the same level of expertise."	R2/R3
Resource Integration	"When funding is managed collectively, it reduces competition and ensures equal participation in innovative projects."	R13/R14
Cross-Regional Collaboration	"Cross-regional teams allow us to learn from others’ mistakes before implementing new systems locally, saving time and resources."	R10
Cross-Regional Collaboration	"By creating cross-regional innovation hubs, we’ve managed to identify scalable solutions for problems unique to smaller regions."	R8/R9

Cross-Regional Collaboration	"The Central Hub hosts workshops where different regions can share their approaches to implementing digital tools, fostering collaboration."	R2/R3
Cross-Regional Collaboration	"A shared portal helps teams access case studies and frameworks from other regions, saving time and improving project success rates."	R6
Cross-Regional Collaboration	"We frequently organize knowledge-sharing events, where regions discuss their experiences with specific AI tools."	R5
Cross-Regional Collaboration	"Regions that successfully deploy AI solutions share their methodologies with others through centralized documentation."	R1