Digital transformation in public management and the application of the Technology Acceptance Model (TAM)

Ioannis Panethymitakis

RN: 2023015003

Thesis Supervisor

Vassilios Moustakis

ABSTRACT

Digital transformation has emerged as a critical driver of modernization in public management, reshaping governance structures, service delivery, and citizen engagement. This thesis conducts a systematic literature review to examine the key drivers, challenges, and impacts of digital transformation in public administration. Using a concept-centric approach based on Webster & Watson (2002), the research categorizes existing literature into five main themes: Digital Transformation, Public Management & Governance, Organizational Change & Innovation, Citizen-Centric Services & Engagement, and Ethical, Legal & Security Concerns.

Findings indicate that digital transformation enhances government efficiency, transparency, and responsiveness but also presents significant challenges, including bureaucratic resistance, cybersecurity risks, and the digital divide. The study highlights the critical role of digital leadership, regulatory frameworks, and technological integration in shaping the success of digital initiatives. Additionally, the COVID-19 pandemic is examined as a key accelerator of digitalization in public administration.

Despite the growing body of research, gaps remain in understanding the long-term impacts of digital governance, particularly in developing economies. The study calls for further comparative, longitudinal, and empirical research on AI ethics, digital inclusion, and cybersecurity within public administration. By addressing these gaps, policymakers and scholars can enhance the strategic implementation of digital transformation initiatives, ensuring more inclusive and resilient governance models in the digital age.

Keywords: *Digital transformation, public management, e-Government, digital governance, artificial intelligence, citizen engagement, cybersecurity, digital inclusion, policy-making, organizational change*

CONTENTS

LIST OF DIAGRAMS

LIST OF TABLES

CHAPTER 1. INTRODUCTION

Digital transformation refers to the integration of digital technologies into various aspects of an organization, leading to fundamental changes in operations, service delivery, and value creation.

While, in the private sector, digital transformation focuses on leveraging digital technologies to create new business models, improve customer experience, and drive innovation, in the public sector, it aims to enhance public value in areas like efficiency, transparency, citizen satisfaction, government budget efficiency, and streamlined bureaucracy through the adoption of advanced digital tools, such as cloud computing, artificial intelligence (AI), and big data analytics.

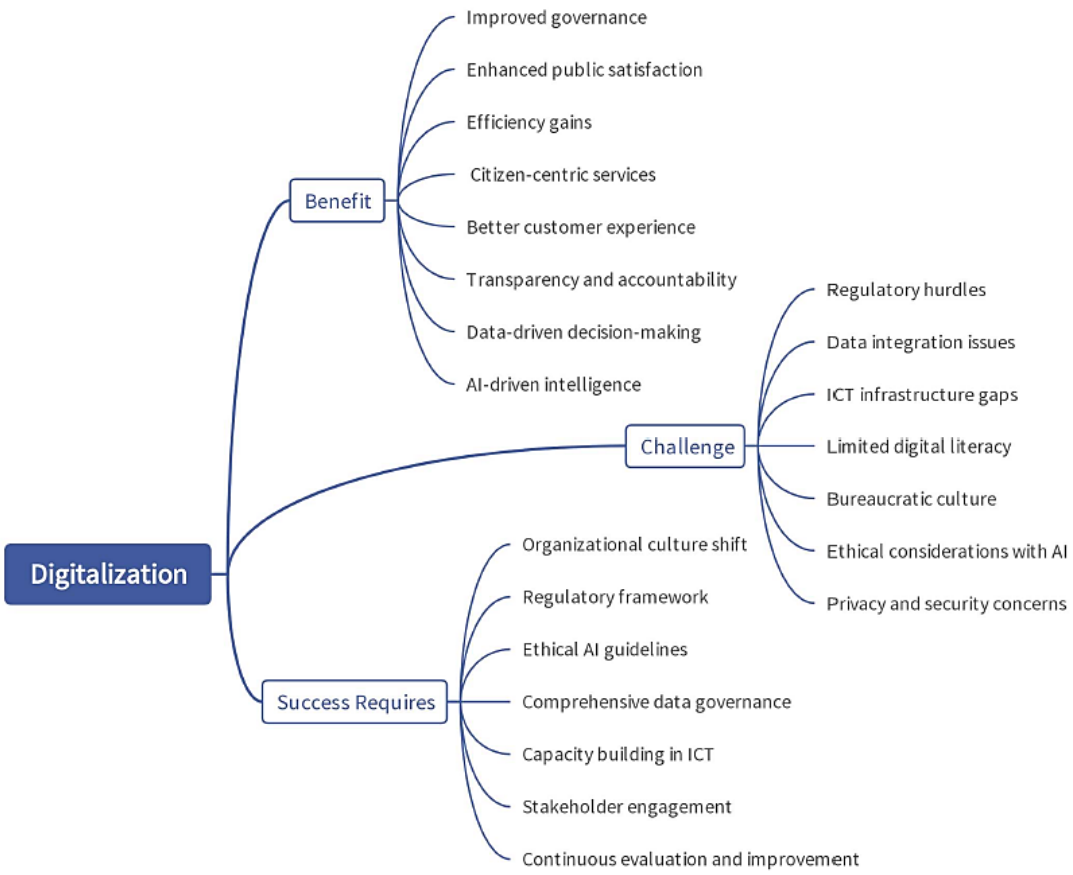
One of the primary drivers of digital transformation in the public sector is the increasing demand for accessible, user-friendly, and efficient services. Governments worldwide are leveraging digital platforms to provide e-government services, streamline administrative processes, and facilitate data-driven decision-making. Digital identification systems, online tax filing, and smart city initiatives are examples of successful digital interventions that enhance public service delivery.

The subject has garnered significant attention in recent years, with governments prioritizing the integration of digital technologies to enhance service delivery, efficiency, and citizen engagement (Latupeirissa et al., 2024). Digital government strategies have become fundamental in modernizing public administration, fostering transparency, and improving public satisfaction (Restrepo-Carmona et al, 2024). A key aspect of this transformation is the shift toward a more citizen-centric approach, where governments actively engage citizens as participants in policymaking and service design (Zakiuddin et al., 2024). This requires adopting new ways of working with stakeholders, implementing innovative service delivery practices, and creating strategies that effectively engage with the market.

Additionally, the increasing application of digital technologies necessitates that public officials develop essential digital competencies, including proficiency in digital tools, data analytics, and online citizen engagement (Kusmaryanto, 2025). The literature also emphasizes the intersection of digital transformation and knowledge management in the

public sector, underscoring the need for governments to understand how digitalization reshapes organizational knowledge structures (Alvarenga et al., 2020). Furthermore, artificial intelligence (AI) is being increasingly integrated into public administration, promising enhanced efficiency but also raising concerns about bias, legality, and accountability (Zyzak et al., 2024).

Diagram 1.1: Digitalization in public service delivery map



Source: Latupeirissa et al. (2024)

Despite its numerous advantages, digital transformation in the public sector presents a range of complex challenges. Legacy systems, bureaucratic resistance, and data privacy concerns often hinder the adoption of new technologies (Enang et al., 2020). A major concern is the protection of citizens' personal information, as governments must ensure secure and responsible data governance. Moreover, while digitalization improves accessibility for many, it also risks excluding certain population segments that lack digital literacy or access to digital platforms, highlighting issues of equity and inclusiveness (Leonardsen et al, 2023). Institutional change is another critical challenge, as

governments must reform bureaucratic structures and processes to support effective digitalization. The governance of big data also poses difficulties, requiring careful regulation to balance innovation with ethical considerations and cybersecurity efforts. In addition, the application of AI in public administration introduces challenges related to accuracy, responsibility, and power dynamics. Urban studies further reveal that digital maturity varies by city size, influencing how effectively digital initiatives are implemented (Akgün et al., 2024).

Addressing these multifaceted challenges is crucial for ensuring that digital transformation in the public sector leads to sustainable, equitable, and effective governance. Governments must adopt a strategic approach that includes regulatory reforms, capacity building, and investment in secure digital infrastructure. Collaboration between the public and private sectors can further accelerate digital innovation while maintaining security and ethical standards.

1.2 Research objectives

This thesis explores digital transformation in the public sector through a systematic literature review, examining existing scholarly research, theoretical frameworks, and empirical studies to develop a comprehensive understanding of the subject. By analyzing research on digital transformation in public service delivery, the study identifies key challenges, adoption barriers, opportunities, and best practices that can support effective digitalization efforts and enhance service outcomes.

To achieve this, a systematic search strategy was employed, retrieving relevant literature from the Scopus database and conducting an in-depth review of studies, reports, and publications on public sector digitization. This structured approach ensures the inclusion of a diverse range of studies, providing valuable insights into the complexities of digital transformation in public services.

By examining the selected publications, this study aims to:

- Determine the most critical concepts that are the focus of scholarly discussion.

- Outline relevant theories, approaches, and research themes associated with each concept.
- Emphasize major findings from digital transformation efforts.
- Uncover research gaps and potential directions for future studies.

1.3 Structure of the study

This thesis is organized into nine chapters, each systematically addressing key aspects of digital transformation in public management.

Chapter 1 introduces the study by outlining the research background, objectives, and significance of digital transformation in the public sector. It also provides an overview of the challenges and opportunities associated with integrating digital technologies into public administration.

Chapter 2 details the methodology employed in this literature review, specifically the concept-centric approach based on Webster & Watson (2002). It describes the literature selection process, inclusion and exclusion criteria, and the backward and forward search techniques used to ensure a comprehensive synthesis of relevant research.

Chapter 3 presents the organization of literature by concept, classifying the selected studies into five overarching themes: Digital Transformation, Public Management & Governance, Organizational Change & Innovation, Citizen-Centric Services & Engagement, and Ethical, Legal & Security Concerns. Each concept is further divided into sub-concepts to provide a structured analysis of the existing body of knowledge.

Chapters 4 through 8 provide an in-depth discussion of each identified concept. Chapter 4 explores the core concept of digital transformation, focusing on its definition, key drivers, challenges, and the impact of the COVID-19 pandemic as a catalyst for digitalization. Chapter 5 examines digital-era governance, open government, and policy-making in the digital age. Chapter 6 discusses organizational change, digital leadership, and strategies for managing transformation within bureaucratic structures. Chapter 7 addresses citizen-centric digital services, smart cities, digital platforms, and digital

inclusion. Chapter 8 highlights ethical, legal, and security concerns, including data privacy, cybersecurity, and regulatory frameworks for digital governance.

Finally, Chapter 9 presents the study's conclusions, summarizing the current state of research, identifying key concerns and limitations, and suggesting future research directions.

CHAPTER 2. METHODOLOGY OF LITERATURE REVIEW

2.1 The Webster & Watson Method for Literature Review

The Webster & Watson (2002) method for literature reviews is a concept-centric approach that focuses on identifying and synthesizing key theoretical contributions in a research field. It is widely used in business, information systems, and management research to develop new frameworks, research agendas, or theoretical insights.

The key principles of the method are:

1. Concept-Centric vs. Study-Centric Approach
    - Unlike systematic reviews that summarize individual studies, this method groups literature by key concepts rather than individual papers.
    - The goal is to synthesize theories, identify gaps, and propose future research directions.
2. Backward and Forward Searching
    - Backward search: Reviewing references cited in foundational papers to identify prior research.
    - Forward search: Identifying newer papers that cite the foundational studies to track recent developments.
    - Ensures comprehensive coverage of both past and emerging literature.
3. Structure of the Literature Review
    - Introduction: Defines the research problem and justifies the need for a literature review.
    - Conceptual Framework: Organizes literature into key themes or constructs.

- Analysis and Synthesis: Identifies patterns, gaps, and contradictions in existing research.
- Future Research Directions: Proposes new research questions or theoretical extensions.

4. Developing Theoretical Contributions
    - The method does not simply summarize existing work but seeks to critically evaluate and synthesize knowledge.
    - Helps scholars build new frameworks, challenge existing theories, or propose new research models.

The Webster & Watson method is often used in Literature reviews because it is suitable for exploring emerging topics where theoretical development is needed, it helps organize literature in a logical, thematic structure rather than chronologically and it encourages critical evaluation of research rather than mere summarization.

To apply the Webster & Watson (2002) method for a concept-centric literature review, we need to follow a structured process:

1. Define the Research Scope

- Clearly state the research question or objective.
- Identify the main concepts and themes relevant to the topic.
- Use previous relevant literature reviews
    - Conduct a search in scientific databases with a combination of words from the topic and the words “review”, “literature review”, “state of the art”, “mapping”, “bibliometric analysis”.

Example:

If the research topic is **"Digital Transformation in the Public Sector,"** possible themes might include:

- E-Government
- Smart Cities
- AI and Automation in Public Services
- Digital Inclusion and Equity

2. Conduct a Comprehensive Literature Search

- Select search terms
    - By studying previous literature reviews on the topic to be studied, we determine an appropriate set of search terms (Webster and Watson, 2002).
- We need access to academic databases such as:
    - Google Scholar, Scopus, Web of Science, IEEE Xplore, ScienceDirect, PubMed (for health-related topics), etc.
- Defining additional search criteria to limit outcomes, such as:
    - Language of publication of the articles
    - Research area
    - Type of publication source (e.g. scientific journals, conferences, book chapters)
    - Years of publication of the articles

3. Use Two Search Strategies:

1. Backward Searching – Check the references of key papers to find foundational research.
2. Forward Searching – Find newer studies that cite key papers using tools like Google Scholar's "Cited by" feature.

4. Organize the Literature by Concept (Not by Author)

- Identify key themes across multiple studies.

- Group the papers based on common ideas rather than summarizing each paper separately.

Table 2.1: Example of Concept-Centric LR Organization

Theme	Key Findings	Key Authors
E-Government Adoption	Digital services increase efficiency but face privacy concerns	Janssen et al. (2021), Brown & Grant (2010)
Smart Cities	IoT and AI improve urban management	Meijer & Rodríguez Bolívar (2016)
Challenges of Digital Transformation	Bureaucratic resistance slows progress	Mergel et al. (2019)

5. Analyze and Synthesize the Literature

- Compare and contrast different studies and viewpoints.
- Identify research gaps and inconsistencies in the literature.
- Highlight emerging trends and unresolved issues.

Example:

- Many studies discuss technical challenges of digital transformation, but fewer address organizational and cultural resistance in government institutions.
- Some researchers argue that AI improves efficiency, while others warn about ethical concerns (e.g., bias in public sector AI applications).

6. Develop a Conceptual Framework

- Summarize findings using a diagram or table that connects key themes.
- Propose future research directions based on gaps in the literature.

7. Write the Literature Review

Follow a structured format:

i) Introduction – Define the research problem and justify the review.

ii) Conceptual Themes – Present key themes (not individual papers).

iii) Analysis & Synthesis – Compare studies, identify gaps, and highlight contradictions.

iv) Future Research Directions – Suggest unanswered questions and areas for further investigation.

v) Conclusion – Summarize key insights.

In a 2020 article (Watson & Webster, 2020), the authors revised and expanded the 2002 model, introducing new methods for literature synthesis:

- Graph-Based Knowledge Encoding
    - Suggests encoding knowledge using graph theory to create structured, searchable databases.
    - Advocates for using graph databases (e.g., Neo4j, Cypher language) to visualize conceptual relationships.
- Meta-Synthesis of Knowledge
    - Proposes structuring literature as a graph where nodes represent concepts and edges define relationships (e.g., causal, moderating).
    - Encourages journals and scholars to contribute to a shared graph-based knowledge database.
- Creativity in Literature Reviews
    - Emphasizes that theoretical contributions require creativity, suggesting techniques such as:
        - Mind mapping and brainstorming tools.

- Daydreaming and mindfulness to enhance creative synthesis.
- Software tools (e.g., Post-it® App, MindMeister) to visualize relationships between concepts.

Table 2.2: Comparison between 2002 and 2020 Webster & Watson models

Feature	2002 Model (Original)	2020 Model (Updated)
Approach	Concept-centric, theme-based synthesis	Concept-centric with graph-based synthesis
Search Strategy	Backward & forward searching	Digital encoding & structured graph search
Data Organization	Concept matrix	Graph database with relationships
Writing Style	Structured narrative review	Structured review with computational analysis
Theoretical Contributions	Identify research gaps & propose new theories	Use graph analytics to identify hidden connections

2.2 Selected Literature Reviews on the topic

In order to identify previews Literature Reviews on the topic, we conducted an 'initial' rough search in Scopus database using the terms: *'digital AND transformation AND public AND management AND literature AND review'* and spotted references that include these terms in their *TITLE, ABSTRACT or KEYWORDS*.

The outcome was 132 references, out of which by diminishing the results to only document type of Review and excluding documents that were dealing with specific focus (not general, according to our topic), we came up with 3 articles that are presented in Table 2.3.

Novianto (2023) presents a systematic literature review on models of digital transformation in the public sector, aiming to identify key factors influencing successful implementation. The study addresses the ambiguity of strategies and limited knowledge on the determinants of digital transformation, which have resulted in both successful and failed initiatives worldwide. Using Scopus as the primary database, the study

applies PRISMA methodology and content analysis to examine existing literature, leading to the development of a comprehensive model for public sector digital transformation.

The proposed model categorizes the transformation process into four key elements:

1. External Factors – Encompassing legislative support, funding availability, regulatory frameworks, and the influence of external pressures such as economic or political changes.

2. Organizational Factors – Covering aspects like leadership, organizational culture, human resource development, and the need for clear strategic visions.

3. Citizen Factors – Highlighting public participation, digital literacy, and socio-demographic considerations, which impact the adoption and inclusivity of digital initiatives.

4. Technological Factors – Addressing data security, IT infrastructure, interoperability, and the challenges of integrating emerging technologies like AI and blockchain.

The study emphasizes that successful digital transformation requires a holistic approach, balancing technological innovation with governance structures and citizen engagement. Lessons from case studies worldwide reveal that unclear strategies, poor regulatory alignment, and lack of resources often lead to failures. The study also identifies the COVID-19 pandemic as an accelerator of digital transformation, particularly in healthcare and education.

Novianto recommends further quantitative research to validate the model and enhance its generalizability, as well as comparative studies across different regional and policy contexts. The research contributes to public administration by providing a structured framework for managing digital change and improving service efficiency in the public sector.

Table 2.3: Selected Literature Reviews on the topic

Nr.	Article	Key Words	Methodology
1	Novianto, N. (2023). Systematic Literature Review: Models of digital transformation in the public sector. Policy & Governance Review, 7(2), 170-194. doi:10.30589/pgr.v7i2.753	[("digital transformation" **OR** "digitization" **OR** "digitalization" **OR** "digital transform" **OR** "digital switch-over" **OR** "digitization" **OR** "advantages automation" **OR** "digitalization advantages" **OR** "digitization" **OR** "digitalization" **OR** "digitizing" **OR** "computerization" **OR** "digitized" **OR** "digitize" **OR** "automatization") **AND** ("public sector" **OR** "public organization" **OR** "governance" **OR** "government" **OR** "governmental")].	**DATABASES:** Scopus DB. **SELECTION CRITERIA:** a) relevancy of title, abstract and keywords b) Subject area: Social sciences c) Empirical studies d) In English **RESULT:** 531 articles
2	Latupeirissa, J. J. P., Dewi, N. L. Y., Prayana, I. K. R., Srikandi, M. B., Ramadiansyah, S. A., & Pramana, I. B. G. A. Y. (2024). Transforming public service delivery: A comprehensive review of digitization initiatives. Sustainability, 16, 2818. https://doi.org/10.3390/su16072818	Combinations of the below sets of terms in phrases combined with **AND**: "electronic", "government", "digital", "transformation", "public", "service", "services"	**DATABASES:** Scopus DB. **SELECTION CRITERIA:** a) Years between 2018 and 2023 b) In English **RESULT:** 114 articles

Nr.	Article	Key Words	Methodology
3	Haug, N., Dan, S., & Mergel, I. (2024). Digitally-induced change in the public sector: A systematic review and research agenda. Public Management Review, 26(7), 1963–1987. https://doi.org/10.1080/14719037.2023.2234917	[('e-government' **OR** 'e-governance' **OR** 'digital government' **OR** 'digital governance' **OR** 'transformational government' **OR** digitisation **OR** digitalisation **OR** 'digital transformation') **AND** (government **OR** 'public administration' **OR** 'public sector' **OR** 'public service')]	**DATABASES:** Web of Science Social Science Citation Index (SSCI) and EBSCO Business Source Premier databases **SELECTION CRITERIA:** a) Peer reviewed journal articles b) In English c) Title or Abstract relevance d) Abstract relevance **RESULT:** 960 articles

Latupeirissa et al. (2024) present a comprehensive review of digital transformation in public service delivery, analyzing the effects of digitization initiatives on local governments worldwide. Through a systematic literature review, the study highlights key benefits, challenges, and governance solutions associated with digital transformation. The authors emphasize that integrating digital technologies enhances public service efficiency, citizen engagement, and governmental accountability. However, they also recognize critical obstacles such as digital divides, privacy concerns, and the need for regulatory frameworks to ensure inclusive and ethical digitization.

The study identifies several core drivers of digital transformation, including technological readiness, organizational efficiency, and political or regulatory pressures. It stresses that citizen-centric digital services are essential for improving the public sector, yet many initiatives still struggle to fully realize this vision. Artificial intelligence and big data are noted as pivotal tools in modern governance, streamlining decision-making and optimizing resource allocation. However, issues such as algorithmic bias, data security, and the loss of human interaction in service provision remain significant challenges.

The research underscores the necessity of a balanced approach to digital transformation, advocating for governance models that integrate ethical AI practices and inclusive policy-making. Citizen engagement is crucial for designing effective digital services that align with public needs, fostering greater trust and satisfaction in government services. The study concludes by urging further research on best practices in digital governance to enhance public sector digitalization sustainably and equitably.

Haug et al. (2024) conduct a systematic literature review on digitally-induced change in the public sector, distinguishing between incremental and transformative digital changes. The study, published in *Public Management Review*, utilizes the PRISMA method to analyze 164 studies and identify key drivers, mechanisms, and outcomes of digital transformation in governmental organizations.

The authors argue that digital transformation is not a single, uniform process but a continuum ranging from incremental improvements, such as enhanced digital service

delivery, to broader transformative changes affecting organizational structures and governance models. They emphasize that while new technologies serve as catalysts for digital transformation, the most significant drivers of change lie within managerial activities and organizational dynamics.

Key external drivers of digital change include political systems, regulatory requirements, economic conditions, and technological advancements. Internally, factors such as leadership, digital infrastructure, inter-organizational collaboration, and workforce digital competencies play a crucial role. The study finds that most digital transformation in public administration occurs incrementally, often through small-scale innovations that accumulate over time to produce broader systemic effects.

The outcomes of digital transformation are categorized into four areas: improved service delivery, enhanced administrative efficiency, changes in stakeholder relationships, and societal impacts such as increased transparency and reduced corruption. However, the study also highlights challenges such as digital divides, surveillance risks, and resistance to change within bureaucracies.

Haug et al. propose a research agenda focusing on actor-centric approaches, longitudinal studies to assess long-term transformation effects, and critical evaluations of potential negative outcomes. Their findings contribute to a more nuanced understanding of how digital technologies shape public sector reforms, emphasizing that transformation is an ongoing, multi-faceted process rather than an immediate overhaul.

2.3 Search Terms

Based on the examples of articles from the previous paragraph and following the methodology of Webster & Watson, the process of searching for relevant scientific literature for this review included, in the 1st stage, a keyword search in the Scopus Database (Table 1) and resulted in 6135 references.

Table 2.4: Keyword search in Stage 1

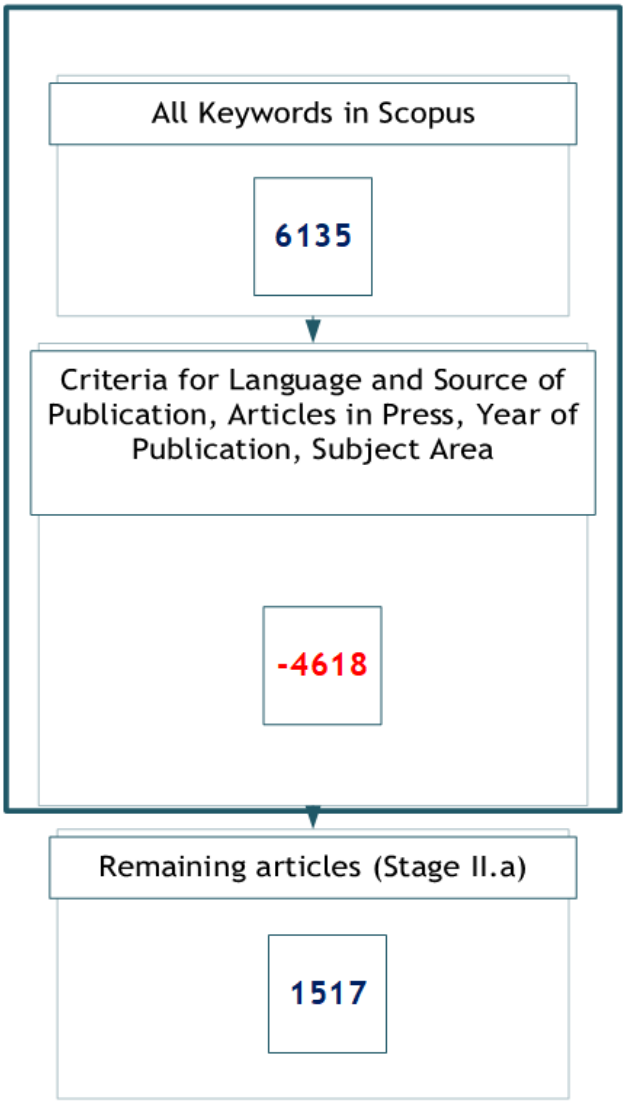
Search Field	Keywords
Abstract - Title - Keywords	digit* **AND** (transform* **OR** switch-over) **AND** public **AND** (manag* **OR** sector **OR** service* **OR** admin* **OR** organization*)

2.4 Inclusion and Exclusion Criteria

In the second stage, the initial list of 6135 documents was filtered to (Diagram 2.1):

- Include only English-language text (5641 documents found)
- Exclude books, book chapters, conference papers, conference reviews, editorials, notes, short surveys, data papers, retracted, erratum and letters (2808 documents found)
- Exclude Articles in Press (2679 documents found)
- Include References published only between 2015 and 2024 (2341 documents found)
- Include references only in subject areas: “Social sciences”, “Business, Management & Accounting” and “Economics, Econometrics & Finance” (1517 documents found)

Diagram 2.1: Inclusions / Exclusions of Articles in Stage II.a



2.4.1 Articles excluded by Title or Abstract

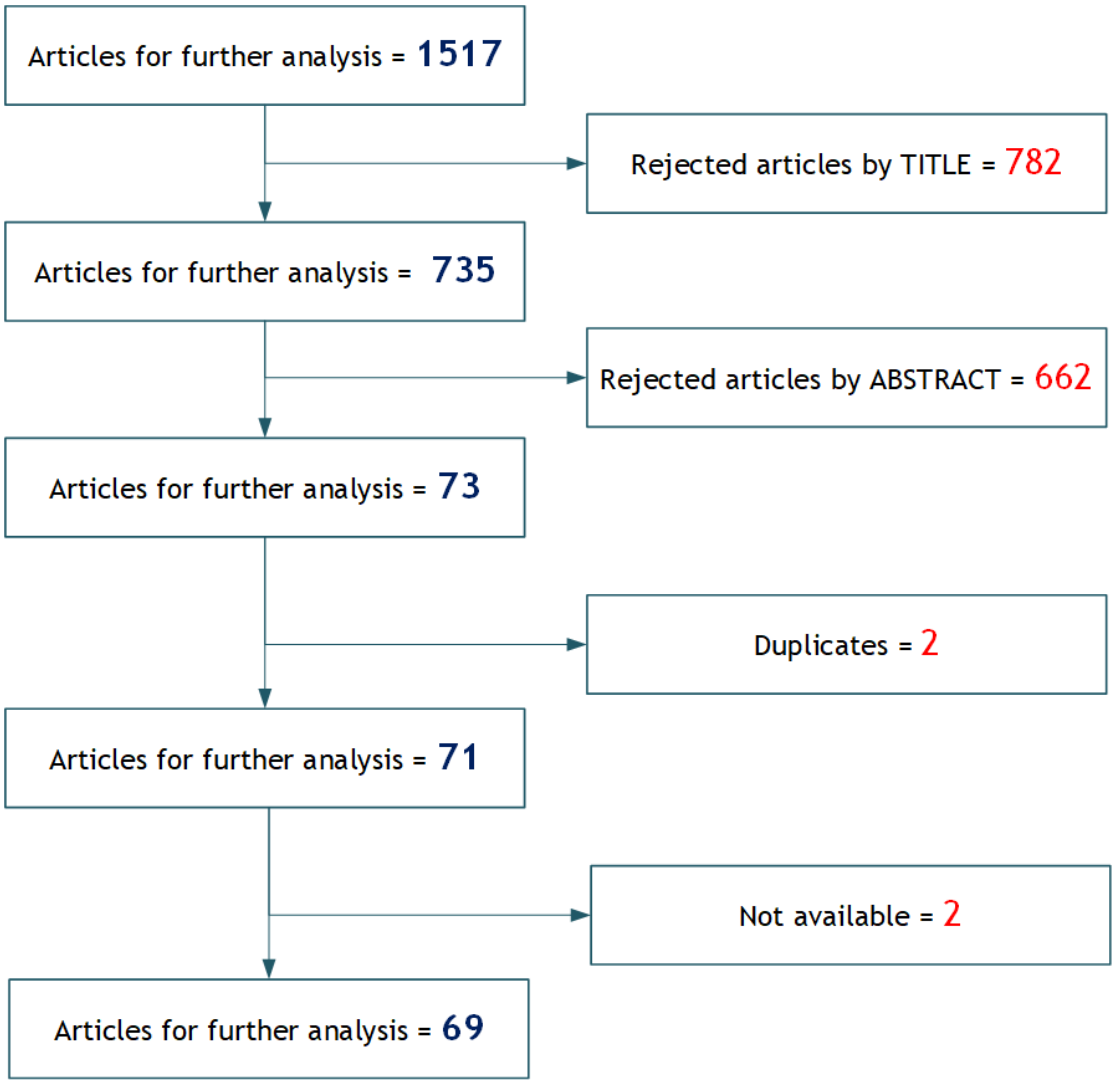
The next step was to read the article titles and exclude those that were not related to the research topic, referred to more general digitization aspects and/or did not concern he public sector. It is noted that since the number of references of the previous stage was quite big, the search and exclusion took place in 2 phases., in order to be thorough.

In this way, 782 articles were excluded.

From the reading of the abstracts (2-phase process, as above), a further 289 articles were excluded, mainly for the same reasons as in the previous step.

Finally, we excluded duplicate records (2 cases), as well as articles that we could not have access to (2 references) and resulted in the outcome of Diagram 2.2.

Diagram 2.2: Inclusions / Exclusions of Articles in Stage II.b



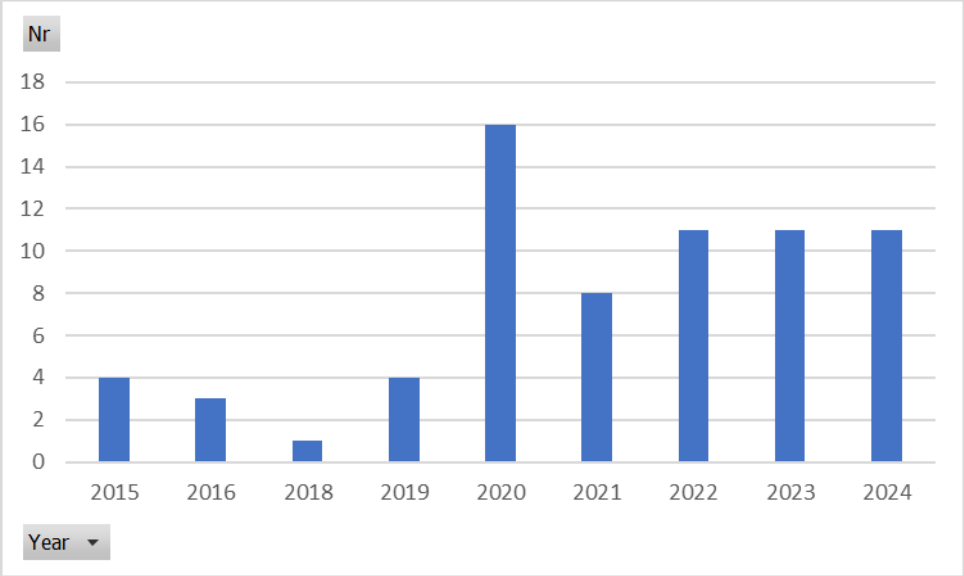
2.5 Descriptives of publications

Overall, the statistical elaboration on the references above demonstrates an increasing academic focus on digital transformation in public management, with a predominance of empirical research and a geographically diverse distribution of case studies.

2.5.1 Publications per Year

The temporal distribution of publications on digital transformation in public management reveals an increasing trend in research activity over the past decade. Between 2015 and 2019, the number of publications remained relatively low, with a total of 12 papers published during this period. However, a notable increase is observed from 2020 onwards, with the number of annual publications consistently exceeding 10. The peak occurred in 2020, with 16 publications, while 2021, 2022, 2023, and 2024 each had a stable output of 8 to 11 publications. This upward trajectory suggests a growing scholarly interest in the topic, potentially driven by advancements in digital transformation technologies and the increasing necessity for digital adaptation in public management, especially in response to global crises such as the COVID-19 pandemic. These findings align with broader literature indicating a surge in digital governance research in recent years (Novianto, 2023).

Diagram 2.3: Publications per year (2015-2024)



2.5.2 Publications per Type

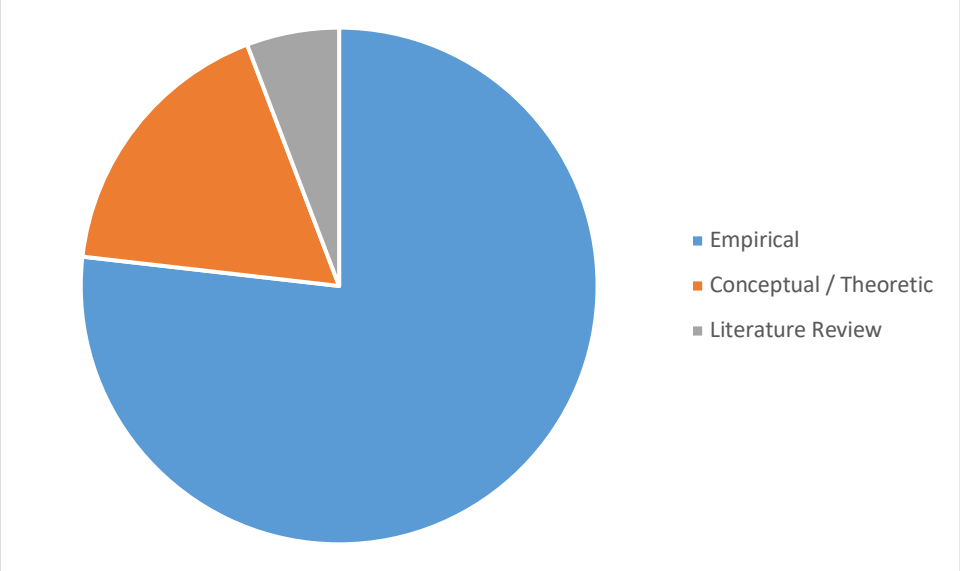
Empirical studies rely on observed and measured phenomena to answer research questions or test hypotheses. They involve collecting and analyzing primary or secondary data to draw evidence-based conclusions. These studies can be quantitative, using numerical data and statistical analysis, qualitative, focusing on non-numerical

data like interviews and observations, or mixed-methods, which combine both approaches for a comprehensive understanding. Empirical research is essential for validating theories and generating real-world insights.

In contrast, non-empirical studies do not collect new data but instead focus on theoretical, conceptual, or analytical approaches. Theoretical studies refine models or frameworks, while conceptual studies explore abstract ideas. Literature reviews systematically analyze existing research, and simulation or modeling studies use computational models to predict outcomes. These methods contribute to knowledge development by synthesizing information, proposing frameworks, or exploring relationships between variables without direct empirical observation.

An analysis of publication types of our literature review indicates that the majority of studies (76.8%) are empirical (n = 53), reflecting a strong focus on practical implementations and case studies. Conceptual and theoretical contributions account for 12 references (17.4%), highlighting the need to establish robust theoretical frameworks that guide digital transformation initiatives in public administration. Literature reviews are the least represented category (n = 4, 5.8%), suggesting a gap in comprehensive syntheses of existing knowledge. The predominance of empirical studies indicates that research in this domain is application-driven, emphasizing real-world experiences and policy implications, a trend also observed in other reviews of digital governance literature (Haug & Mergel, 2024; Latupeirissa et al., 2024).

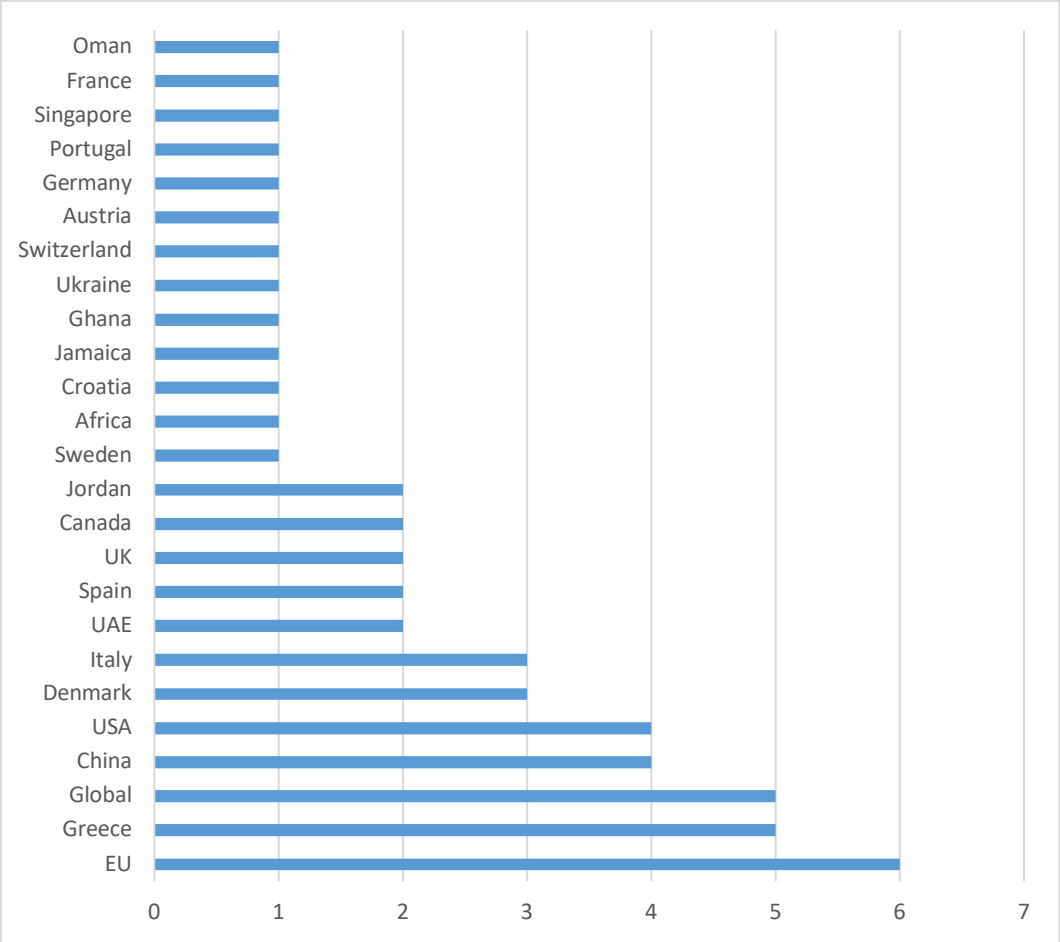
Diagram 2.4: Publications per type (2015-2024)



2.5.3 Empirical Publications per Country / Region

A geographical analysis of empirical studies reveals a diverse distribution of research across multiple regions, with the European Union (n = 6) and Greece (n = 5) being the most frequently studied locations. Global studies (n = 5) and research focused on China (n = 4) and the United States (n = 4) also contribute significantly to the literature. Other countries such as Denmark, Italy, the United Arab Emirates, Spain, and the United Kingdom each account for two or more studies.

Diagram 2.5: Empirical Publications per Country / Region (2015-2024)



The presence of empirical research across a broad spectrum of countries suggests a widespread recognition of the importance of digital transformation in public management, albeit with varying regional emphases. This distribution is consistent with

prior findings that highlight regional disparities in digital governance research, often influenced by policy frameworks, technological infrastructure, and governmental priorities (Latupeirissa et al., 2024). Additionally, the limited representation of studies from Africa, Latin America, and certain Asian countries underscores the need for more geographically inclusive research efforts in the future.

2.6 Backward and Forward Search

In the final stage of backward and forward search phase, following the approach of Webster & Watson (2002), we systematically identified relevant literature for our review on *Digital Transformation in Public Management*.

1. **Backward Search (Reviewing Citations of Key Articles)**

   We began by identifying a set of core, high-impact articles that directly address digital transformation in public management, independently of the year of issuance.

   For each key article, we examined its reference list to identify foundational theories, prior research, and influential studies.

   This process allowed us to trace the origins of key concepts and include seminal works that form the theoretical foundation of our review.

   In this way, we included 4 references for further reading.

2. **Forward Search (Tracking Citations of Key Articles)**

   After identifying core articles, we conducted a forward search by finding more recent papers that cited these key works.

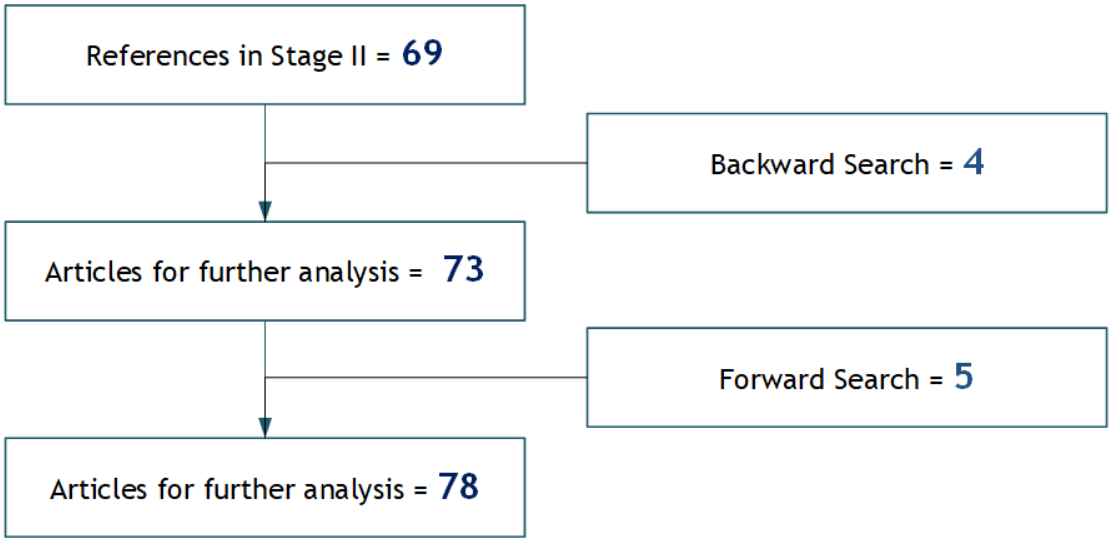
   This helped us capture the latest developments, emerging themes, and evolving discussions within the field.

   By reviewing newer studies that reference our core literature, we ensured that our review remained current and aligned with ongoing scholarly debates.

In this way, we included 5 references for further reading.

Through this iterative process, we strengthened the depth and breadth of our literature review, ensuring that we incorporated both foundational research and the most recent advancements in the field by including 78 references to read further (Diagram 2.6).

Diagram 2.6: Inclusions / Exclusions of Articles in Stage III



CHAPTER 3. ORGANIZATION OF LITERATURE BY CONCEPT

The Webster & Watson approach emphasizes a **concept-centric** organization of literature rather than a chronological or author-by-author summary. This means that studies are grouped under **key themes or concepts** relevant to the research topic rather than being reviewed individually.

The steps to Organizing Literature by Concept are the following:

1. **Identify Core Concepts**
    - Determine the main **themes, constructs, or categories** relevant to the research area.
    - Concepts should be broad enough to encompass multiple studies but distinct enough to provide structure.
2. **Categorize Literature Under Each Concept**
    - Assign studies to relevant **conceptual categories** rather than listing them separately.
    - Each section of the literature review should discuss one **concept**, integrating findings from multiple sources.
3. **Compare and Contrast Studies**
    - Within each conceptual category, analyze similarities and differences between studies.
    - Discuss how findings align, contradict, or build upon each other.
4. **Identify Research Gaps**
    - Highlight what is well established and where **gaps or inconsistencies** exist in the literature.
    - Use these insights to justify the need for further research.

In accordance with this methodological approach, we conducted a concept-driven synthesis of the existing body of knowledge on *Digital Transformation in Public Management*. This framework enabled us to classify the literature based on central themes and subthemes, ensuring a comprehensive and structured review of relevant scholarly contributions.

Our process followed **three key steps**:

1. Identifying core concepts from the literature,
2. Categorizing sub-concepts that capture specific dimensions of these core themes, and
3. Quantifying the number of relevant references for each sub-concept to assess the extent of scholarly engagement with the topic.

This classification provides a structured overview of key research areas, revealing both well-explored and under-researched aspects of digital transformation in public administration.

We structured the literature, which we derived in Chapter 2, into **five overarching concepts**, each containing several sub-concepts that capture distinct aspects of digital transformation in the public sector. Below is a detailed breakdown of our categorization:

1. **Digital Transformation (Core Concept)**
    - *Definition and Scope in Public Sector*: Establishes the foundational understanding of digital transformation within the realm of public administration.
    - *Key Drivers and Challenges in Public Administration*: Explores enablers, barriers, and contextual challenges associated with digital transformation in governmental institutions.
    - *COVID-19 as a Catalyst for Digital Transformation in the Public Sector*: Analyzes how the pandemic accelerated digital initiatives and policy responses.

2. **Public Management & Governance**

    - *Digital Era Governance (DEG)*: Examines governance models that leverage digital technologies for improved efficiency, accountability, and decision-making.

    - *Open Government and Transparency*: Focuses on digital tools enhancing governmental openness, citizen trust, and access to information.

    - *Policy-Making in the Digital Age*: Investigates the role of big data, AI, and participatory platforms in modern policy formulation and evaluation.

3. **Organizational Change & Innovation**

    - *Digital Leadership and Culture*: Discusses the role of leadership in fostering a digital-first organizational mindset.

    - *Change Management in Bureaucratic Structures*: Evaluates strategies to overcome resistance to digital transformation in rigid public institutions.

4. **Citizen-Centric Services & Engagement**

    - *Smart Cities and IoT Applications*: Explores digital infrastructure that enhances urban governance and service delivery.

    - *Digital Platforms and Citizen Engagement*: Analyzes how online platforms facilitate participatory governance and direct citizen involvement.

    - *Digital Inclusion and Accessibility*: Addresses equity in digital public services, ensuring all citizens can benefit from digital advancements.

    - *Public-Private Partnerships in Digital Services*: Examines collaboration between governments and private entities to co-develop digital solutions.

5. **Ethical, Legal & Security Concerns**

- *Data Privacy and Cybersecurity*: Investigates risks associated with digital governance, including data protection and cybersecurity threats.
- *Legal Frameworks for Digital Governance*: Reviews legal and regulatory structures governing digital initiatives in the public sector.

Details about references for each concept and sub-concept are presented in Table 3.1

Table 3.1: References per concept and sub-concept

Concept	Sub-concept	Nr of references
DIGITAL TRANSFORMATION (Core Concept)	Definition and scope in public sector	**5**
	Key Drivers and Challenges in Public Administration	**18**
	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	**7**
PUBLIC MANAGEMENT & GOVERNANCE	Digital Era Governance (DEG)	**13**
	Open government and transparency	**11**
	Policy-making in the digital age	**16**
ORGANIZATIONAL CHANGE & INNOVATION	Digital leadership and culture	**9**
	Change management in bureaucratic structures	**15**
CITIZEN-CENTRIC SERVICES & ENGAGEMENT	Smart cities and IoT applications	**4**
	Digital platforms and citizen engagement	**11**
	Digital inclusion and accessibility	**5**
	Public-private partnerships in digital services	**3**
ETHICAL, LEGAL & SECURITY CONCERNS	Data privacy and cybersecurity	**8**
	Legal frameworks for digital governance	**3**

By employing a **concept-driven review**, we ensured that our synthesis is both **systematic and replicable**, aligning with best practices for literature reviews (Webster & Watson, 2002). This approach not only facilitates an **organized knowledge base** but also helps identify **research gaps**, pointing to areas where further empirical and theoretical contributions are needed.

Our categorization provides **a holistic view** of digital transformation in public management, making it valuable for policymakers, researchers, and practitioners

seeking to understand the interplay of governance, technology, organizational change, and citizen engagement in the digital era.

.

CHAPTER 4. DIGITAL TRANSFORMATION (Core Concept)

4.1 Definition and scope in public sector

Digital transformation in the public sector has become a strategic imperative for governments worldwide, aiming to enhance public service efficiency, citizen engagement, and overall governance quality (Gong et al., 2020). It represents a holistic effort to revise and modernize government processes, services, and interactions with stakeholders beyond the traditional digitization of administrative tasks. It is a shift from merely transferring analog services into digital formats toward a comprehensive restructuring of governance models, policies, and workflows to leverage the full potential of digital technologies (Mergel et al., 2019). The integration of technologies such as artificial intelligence (AI), big data analytics, blockchain, and cloud computing has been recognized as essential to enhancing operational efficiency and transparency in governance.

According to empirical research, public administrations are increasingly driven to adopt digital transformation due to external factors such as citizens' rising expectations for efficient, real-time digital services and supranational agreements like the Tallinn Declaration on eGovernment[1]. Additionally, global events such as the COVID-19 pandemic have accelerated the need for digital government services, compelling institutions to rapidly implement technology-driven solutions (AlNuaimi et al., 2022). Beyond external pressures, internal motivations—including the need to enhance organizational efficiency, improve interdepartmental collaboration, and streamline bureaucratic processes—also play a critical role. Governments must ensure that digital transformation is aligned with institutional objectives while also remaining adaptable to changing technological landscapes.

The **Organization for Economic Co-operation and Development (OECD)** and the **European Union (EU)** have played significant roles in advancing the digital

[1] European Commission (2017). Tallinn declaration on eGovernment. Retrieved from https://www.eu2017.ee/news/insights/tallinn-declaration-egovernment-ministerialmeeting-during-estonian-presidency.

transformation of public organizations through policies, frameworks, and funding initiatives.

The OECD has been at the forefront of guiding governments in their digital transformation journeys. It provides research, best practices, and policy recommendations to enhance digital governance. The OECD Digital Government Framework (OECD, 2020) emphasizes a shift from e-Government to digital transformation by promoting user-driven services, data-driven decision-making, and cross-sector collaboration. The OECD Digital Government Index (OECD, 2023) benchmarks member states on their progress in areas such as open data, AI adoption, and public sector innovation (see Diagram 6.1). Moreover, initiatives like the Recommendation on Digital Government Strategies (2014) and Going Digital Project support governments in leveraging emerging technologies while ensuring inclusivity, security, and transparency.

The European Union has been a key driver of digital transformation in public administration through legislation, funding programs, and strategic roadmaps. The Digital Europe Programme (2021-2027) (EU, 2021a) allocates €7.5 billion to enhance supercomputing, AI, cybersecurity, and digital skills in public services. The eGovernment Action Plan 2016-2020 and the subsequent Digital Decade Policy Programme 2030 (EU, 2021b) set ambitious targets for cross-border digital services, interoperability, and cloud infrastructure development. The EU's Interoperability Framework (EIF) facilitates seamless data exchange across member states, ensuring efficient and citizen-centric service delivery. Additionally, the NextGenerationEU recovery fund (EU, 2021c) provides significant financial support for digitalization in the public sector, reinforcing resilience and modernization in governance. The EU's commitment to digital transformation is further demonstrated by its emphasis on open government principles and the use of ICT to enhance governance efficiency and citizen participation (Irimie, 2015). E-Government initiatives within the EU aim not only to improve administrative efficiency but also to foster transparency, reduce bureaucracy, and enable greater interaction between governments, businesses, and citizens. However, as Irimie (2015) highlights, the pace of digital transformation across EU member states remains uneven, with challenges in decentralization, policy adaptation,

and infrastructural readiness hindering the uniform adoption of e-Government solutions.

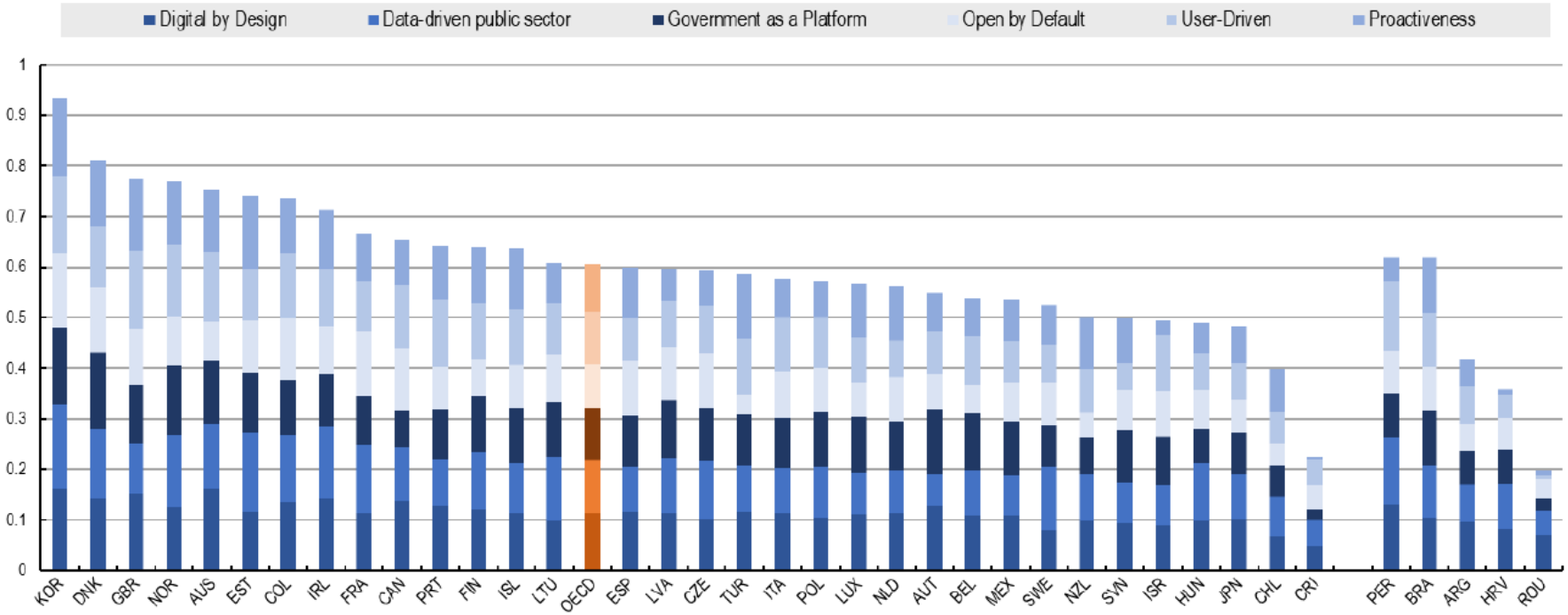
Both organizations continue to shape the future of public administration by fostering collaboration, digital literacy, and policy alignment among governments, ensuring that digital transformation contributes to efficiency, inclusivity, and democratic engagement.

The concept of digital transformation is often conflated with related terms such as digitization and digitalization. However, a clear distinction is necessary: **digitization** refers to the conversion of analog data into digital form (e.g., scanning documents), while **digitalization** entails the use of digital technologies to improve existing processes without necessarily redefining them (See also paragraph 4.2). In contrast, **digital transformation** involves a fundamental rethinking of how public administrations operate, emphasizing user needs, service delivery models, and institutional culture (Mergel et al., 2019). Unlike simple technology adoption, digital transformation requires a shift in mindset at all levels of governance to foster innovation and long-term sustainability (AlNuaimi et al., 2022).

A defining feature of digital transformation is its evolving nature—it is not a finite project but a continuous process of adaptation. Governments worldwide recognize that digital transformation is necessary not only for increasing efficiency but also for reinforcing democratic values, enhancing transparency, and fostering public participation (Mergel et al., 2019). This shift enables more agile governance, where policies and services can be continuously refined to meet societal needs in real-time.

Brunetti et al. (2020) further argue that regional innovation systems illustrate how digital transformation requires a balance between technological infrastructure, digital culture, and ecosystem development. This aligns with existing definitions of digital transformation that highlight its ongoing, evolutionary nature, driven by policy mandates, economic imperatives, and technological advancements.

Diagram 4.1: OECD 2023 Digital Government Index, composite results by country



Note: The data collection period for this edition of the DGI is from 1 January 2020 to 31 October 2022. Data for Germany, Greece, Slovakia, Switzerland, and the United States are not included. Refer to Methodological note.
Source: OECD Survey on Digital Government 2.0.

4.2 Digital transformation along e-Government and Digitalization

A crucial aspect of digital transformation is understanding how it differs from e-Government and digitalization. **E-Government** typically refers to the use of information and communication technologies (ICTs) to enhance government services and interactions with citizens, businesses, and other governmental entities (Gong et al., 2020). It primarily focuses on making services available online and automating administrative processes (Mergel et al., 2019). While e-Government initiatives aim to increase efficiency, they are often limited to improving traditional bureaucratic processes without fundamentally altering governance structures.

However, while e-Government initiatives have contributed to more efficient service delivery, they often fall short of achieving the deeper organizational changes associated with digital transformation. E-Government largely deals with **incremental improvements**, such as providing online forms or enabling electronic tax filing. Digital transformation, on the other hand, **reconceptualizes government functions and services**—it not only digitizes services but also integrates advanced technologies (such as artificial intelligence, big data, and blockchain) to create **more adaptive, responsive, and citizen-centric governance structures** (Mergel et al., 2019; AlNuaimi et al., 2022).

E-Government initiatives have evolved from simple online service portals to complex, interconnected digital ecosystems. The transition can be categorized into three phases:

1. **Digitization (Early 2000s):** Governments primarily focused on converting paper-based processes into digital formats, creating informational websites and basic online services (Mergel et al., 2019). This phase was characterized by static web pages that provided essential government information but lacked interactivity. Although digitization improved information accessibility, citizens still had to visit government offices for most transactions.

2. **Digitalization (2010s):** Governments expanded their services by integrating digital platforms for tax filing, social security management, and online voting. AI-driven chatbots were introduced to improve citizen interactions

(Androutsopoulou et al., 2019). This phase emphasized service efficiency, allowing people to complete transactions online without in-person visits. Additionally, digitalization introduced mobile applications that improved government accessibility, enabling citizens to interact with public administration from anywhere.

3. **Digital Transformation (2020s-Present):** The latest phase is characterized by the integration of emerging technologies like blockchain for secure transactions, big data for policy-making, and IoT for smart city applications (Criado & Gil-Garcia, 2019; Chatfield & Reddick, 2019). Governments are leveraging AI-driven analytics to enhance decision-making and improve service personalization. This transformation not only changes how services are delivered but also redefines administrative structures to be more agile and responsive.

One of the early studies on e-Government, conducted by Tolbert and Mossberger (2006), emphasized the role of digital government services in enhancing citizen trust and confidence in government institutions. Their research found that e-Government could improve public perceptions of transparency, responsiveness, and accessibility by providing digital platforms for service delivery and communication. However, they also noted that e-Government primarily focused on efficiency rather than structural transformation. This aligns with the distinction between e-Government and digital transformation, as the former improves service delivery within existing frameworks while the latter reimagines governance through advanced digital integration and citizen-centric approaches.

Gong et al. (2020) emphasize the multifaceted nature of digital transformation in government settings. Traditional e-Government models primarily focus on service digitization and administrative efficiency, whereas DT involves a more fundamental restructuring of governance models, workflows, and organizational culture.

Another key difference lies in the approach to public service delivery. E-Government follows a more **technocentric** perspective, where the goal is often to digitize existing administrative processes. Digital transformation, in contrast, is **user-centric** and **value-driven**—it aims to reshape interactions between governments and citizens by fostering

co-creation, personalized services, and participatory governance (AlNuaimi et al., 2022). A practical example illustrating this distinction is the transition from merely offering downloadable forms on government websites (e-Government) to developing fully integrated digital platforms where citizens can access, track, and complete entire services seamlessly, often with personalized assistance powered by AI-driven chatbots.

For instance, Brunetti et al. (2020) prove that unlike traditional e-Government initiatives, which digitize services in isolation, a comprehensive digital transformation strategy incorporates aspects like AI-driven governance, regional cooperation, and digital talent development and this multi-stakeholder approach has been identified as crucial for digital transformation.

4.3 Key Drivers and Challenges in Public Administration

The digital transformation of public administration is a complex and ongoing process driven by technological advancements, evolving citizen expectations, and policy imperatives. Governments worldwide are leveraging digital tools to enhance efficiency, improve service delivery, and foster transparency. However, this transformation is accompanied by significant challenges, ranging from bureaucratic resistance to interoperability issues. This section explores the key drivers and challenges influencing digital transformation in public administration, with references to existing research and case studies.

The primary **drivers** include (Mergel et al., 2019; AlNuaimi et al., 2022):

1. **Technological Innovation** – Emerging technologies such as artificial intelligence (AI), cloud computing, blockchain, and big data analytics enable governments to automate processes, optimize resource allocation, and provide personalized services (Thanh et al., 2023; Mergel et al., 2019; AlNuaimi et al., 2022). AI-driven automation, for example, enhances efficiency in document processing, fraud detection, and predictive analytics for public policy planning. Cloud computing facilitates secure and scalable infrastructure, reducing dependency on physical data centers.

2. **Citizen Expectations** – Modern citizens expect public services to be as seamless and user-friendly as those offered by the private sector. Governments must address these expectations by integrating digital platforms, mobile applications, and AI-driven chatbots (Brunetti et al., 2020; Alvarenga et al., 2020). However, varying levels of digital literacy among citizens necessitate inclusive digital transformation strategies, ensuring accessibility for all demographics, including the elderly and underserved communities.

3. **Policy and Regulatory Frameworks** – International agreements, national digital strategies, and supranational directives establish the legal foundation for digital transformation efforts (Kuhlmann & Heuberger, 2023; Assefa et al., 2021). The European Union's Digital Decade 2030 initiative, for example, mandates that 100% of key public services be available online by the end of the decade. Such policies push public administrations to align their strategies with evolving digital governance standards.

4. **Economic Efficiency** – Digital transformation enables governments to reduce costs through process automation, streamlined operations, and data-driven decision-making (Alvarenga et al., 2020; Stender et al., 2024). Automated tax collection systems, digital procurement platforms, and AI-assisted budgeting significantly cut operational expenses. Countries facing fiscal constraints particularly benefit from these efficiency gains.

5. **Organizational Agility** – To sustain long-term transformation, public administrations must develop agility in governance processes, allowing rapid adaptation to technological advancements and policy changes (Brunetti et al., 2020; Storozhenko et al., 2024; Irimie, 2015). The COVID-19 pandemic underscored the necessity for resilient digital infrastructures, as governments worldwide shifted to remote work, digital health monitoring, and virtual public service delivery.

Despite these compelling drivers, digital transformation in the public sector faces several **challenges**, including:

1. **Resistance to Change** – Bureaucratic inertia and deeply embedded organizational culture present significant challenges to digital transformation in

public administration. Many public servants, accustomed to traditional workflows, may resist adopting new technologies due to concerns about job displacement or a lack of familiarity with digital tools (Al-Rwaidan et al., 2023; Hujran et al., 2023; Brunetti et al., 2020; AlNuaimi et al., 2022). This resistance can hinder the successful implementation of digital initiatives, leading to inefficiencies and delays. To address these challenges, governments must implement effective change management strategies, including comprehensive training programs that enhance digital literacy and structured incentive mechanisms that encourage technology adoption. By fostering a culture of innovation and continuous learning, public institutions can ease the transition to digital governance and reduce apprehension among employees.

Cultural resistance within government institutions remains a major barrier to digital transformation, necessitating strong leadership and strategic intervention. Research highlights the importance of change management strategies in addressing bureaucratic inertia and fostering a digital mindset among employees (Brunetti et al., 2020). Governments should prioritize training initiatives that equip public servants with the necessary digital skills, while also introducing incentives that promote active engagement with new technologies. Additionally, establishing clear transformation roadmaps can provide employees with a structured pathway for adaptation, reducing uncertainty and resistance. Without these proactive measures, digital initiatives risk stagnation, ultimately slowing innovation and reducing the effectiveness of public service delivery.

2. **Data Privacy and Security** – As governments continue to digitize public services, ensuring the security and privacy of sensitive citizen data remains a critical priority (Senyo et al., 2021; Kotsev et al., 2020). Cybersecurity threats, including ransomware attacks and data breaches, can significantly undermine public trust in digital governance. To mitigate these risks, governments must implement robust security measures such as encryption, multi-factor authentication, and compliance with data protection regulations like the General Data Protection Regulation (GDPR). Adopting these strategies helps protect personal information from unauthorized access and strengthens confidence in

digital public services. Without adequate safeguards, sensitive data may be exposed to cybercriminals, leading to potential financial and reputational damages.

The increasing integration of digital services further amplifies cybersecurity risks, making strong security frameworks essential for protecting citizen data. Research on IoT-enabled smart government emphasizes the need for comprehensive cybersecurity policies to prevent data breaches and unauthorized intrusions (Chatfield & Reddick, 2019; Storozhenko et al., 2024). Governments must enforce stringent security protocols, including advanced encryption techniques, two-factor authentication, and continuous monitoring, to safeguard digital infrastructures. Without these protective measures, the expanded connectivity and data exchange in GovTech initiatives could be exploited by malicious actors, compromising both public trust and the efficiency of digital governance (See for details also in Chapter 9).

Due to the above, many citizens remain skeptical about digital governance due to concerns over surveillance, data misuse, and potential job losses due to automation (Nielsen et al., 2024). Therefore, governments must foster trust through transparency and citizen engagement initiatives.

3. **Interoperability and Legacy Systems** – Many public institutions rely on outdated IT infrastructure that lacks interoperability with modern digital platforms. Upgrading these systems requires significant investment and strategic planning (Clarke, 2020; Patergiannaki & Pollalis, 2023; Irimie, 2015). A case study on the European Union highlights that fragmented digital systems across member states hinder seamless service delivery and cross-border collaboration (Atobishi et al., 2024).

4. **Digital Inclusion** – While digital transformation improves service accessibility, it also has the potential to deepen the digital divide if certain populations lack the necessary skills or internet access (Waller & Genius, 2015; Profiroiu et al., 2024; Brunetti et al., 2020). To ensure inclusivity, governments must implement strategies that address these disparities by providing digital literacy programs and expanding internet infrastructure in rural and underserved areas. Without

such measures, individuals with limited technological proficiency or restricted internet access may face barriers to accessing essential public services. Ensuring that all citizens can effectively engage with digital platforms is crucial for fostering equal opportunities in an increasingly digitized society.

Limited internet access and digital literacy gaps contribute to inequalities in service accessibility, necessitating targeted policies for digital inclusion. Research highlights the importance of proactive governmental initiatives to promote equitable access to GovTech services (Alvarenga et al., 2020). Investments in digital literacy programs and infrastructure development, particularly in marginalized communities, are essential to bridging this divide communities (Nielsen et al., 2024). Without these efforts, digital transformation may unintentionally reinforce existing socioeconomic disparities by excluding disadvantaged groups from crucial services. Therefore, a comprehensive approach that combines infrastructure expansion with educational initiatives is vital to ensuring that digital public services are accessible to all citizens (See for details also in paragraph 8.2).

5. **Regulatory and Legal Constraints:** The rapid evolution of digital technologies often outpaces regulatory frameworks. A study on digital transformation in Italian public administrations underscores the importance of adaptive legal frameworks that balance innovation with governance (Tangi et al., 2021). Governments must continuously update legal policies to address data privacy, AI ethics, and cross-border digital transactions. Without proper regulation, the adoption of new technologies may lead to legal ambiguities, limiting their potential benefits (Tassabehji et al., 2016).

6. **Defining and Measuring Success** – Unlike e-Government projects with clear deliverables, digital transformation is an ongoing process with qualitative impacts that are difficult to measure (AlNuaimi et al., 2022; Alvarenga et al., 2020; Irimie, 2015). Governments struggle to establish meaningful Key Performance Indicators (KPIs) to evaluate progress. Establishing standardized evaluation frameworks can help assess the effectiveness of digital initiatives.

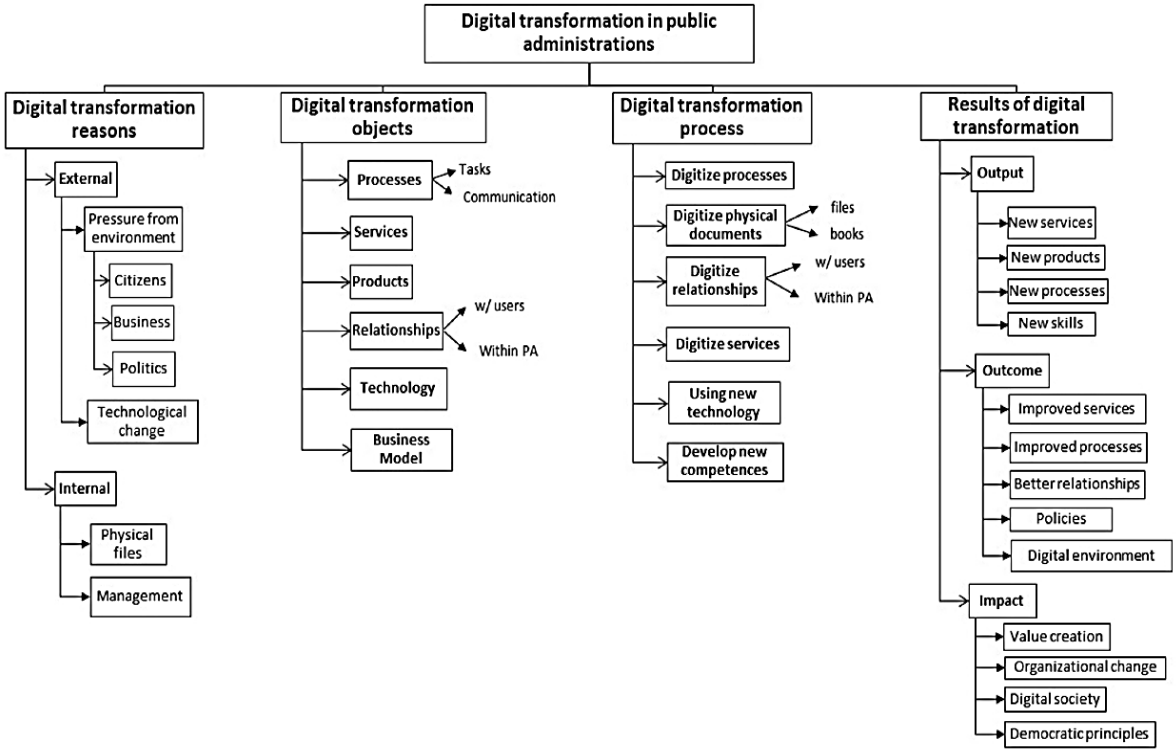
7. **Cost and Infrastructure Challenges:** Implementing digital governance requires substantial investments in IT infrastructure, cloud computing, and workforce training (Kim et al., 2022). Many developing nations struggle to allocate the necessary resources for these transitions, due to:
    - Lack of sustained funding: Digital transformation is a long-term process, and inconsistent budget allocations hinder progress.
    - Dependence on external funding: Many governments rely on international aid or private sector partnerships, which may introduce dependency risks or conflicts of interest.
    - Cost overruns: Digital projects often exceed initial budget estimates due to unforeseen technical challenges and delays.
8. **Algorithmic Bias and Ethical Concerns:** AI-driven governance systems may reinforce biases and lack transparency in decision-making, leading to ethical dilemmas (Clarke, 2020). Developing fair and explainable AI models is critical for ensuring equitable digital governance.

Brunetti et al. (2020) emphasize that addressing these challenges requires a holistic strategy that includes education, technological investment, and collaborative governance models. Moreover, building public-private partnerships, digital campuses, and regulatory support mechanisms fosters an environment where digital transformation can thrive.

Gong et al. (2020) focus on empirical insights into digital transformation efforts of Zhejiang Provincial Government (China,) exploring the drivers of digital transformation, including policy imperatives, technological advancements, and organizational changes. They recognize flexibility as a key enabler of digital transformation . The research identifies barriers and challenges, such as bureaucratic resistance, interoperability issues, and the need for structural flexibility, which are critical to public administration reform.

In general, strategies for addressing challenges in digital transformation of public organizations, may include:

Diagram 4.2: Taxonomy of drivers and challenges in public sector digital transformation



Source: Mergel et al. (2019)

1. **Strengthening Public-Private Partnerships (PPPs)**

    - Collaboration between governments and private-sector technology firms can accelerate digital transformation. Public-private partnerships facilitate knowledge exchange, access to cutting-edge technology, and shared investments in infrastructure development (Brunetti et al., 2020; Kuhlmann & Heuberger, 2023). Examples include GovTech initiatives, where governments collaborate with startups to develop innovative digital solutions (Pors, 2015).

2. **Investing in Workforce Training and Digital Literacy**

    - To overcome resistance to change, governments must invest in continuous training programs that upskill public servants in digital competencies (Al-Rwaidan et al., 2023; Thanh et al., 2023). Reverse

mentoring programs, where younger employees train senior officials in digital tools, have been effective in fostering a digital-first mindset (Torfing et al., 2021).

3. **Enhancing Cybersecurity Measures**

    - A comprehensive cybersecurity strategy is essential to safeguard public data. Governments should adopt zero-trust security models, AI-driven threat detection, and blockchain for secure transactions (Alvarenga et al., 2020; Kotsev et al., 2020; Storozhenko et al., 2024). Regular cybersecurity audits and public awareness campaigns also play a crucial role in ensuring digital trust.

3. **Developing Interoperable Digital Ecosystems**

    - Governments should establish standardized digital frameworks to ensure interoperability across public sector IT systems (Clarke, 2020; Patergiannaki & Pollalis, 2023). The European Interoperability Framework (EIF) serves as a model, promoting common standards for data exchange between government agencies and cross-border public services.

4. **Creating Inclusive Digital Policies**

    - Investments in digital literacy programs and infrastructure can promote inclusivity, ensuring that all citizens benefit from digital governance (Nielsen et al., 2024). Ensuring that digital services are accessible to all citizens requires a focus on digital inclusion initiatives. Governments should provide subsidized internet access, develop user-friendly platforms with multilingual support, and integrate assistive technologies for individuals with disabilities (Waller & Genius, 2015; Profiroiu et al., 2024).

5. **Establishing Adaptive Legal Frameworks and Ethical AI Governance**

    - Establishing regulatory frameworks for AI ensures fairness, transparency, and accountability in automated decision-making

processes (Clarke, 2020). Moreover, governments must update legal and regulatory structures to keep pace with evolving digital governance trends, ensuring compliance with global standards (Tassabehji et al., 2016).

Digital transformation in public administration presents both unprecedented opportunities and significant challenges. While technological innovation, citizen expectations, and economic efficiency drive this transformation, resistance to change, cybersecurity risks, and digital exclusion pose major barriers. Addressing these challenges requires a holistic approach that includes strategic investments, regulatory alignment, and inclusive governance models. As governments navigate this transition, fostering collaboration between stakeholders and prioritizing digital resilience will be key to achieving long-term success (Brunetti et al., 2020; Gong et al., 2020; Irimie, 2015).

4.4 International Indices for Public Sector Policy in the Digital Age

Governments worldwide rely on various indices to evaluate and enhance their digital policies. These indices help policymakers assess digital transformation, technology adoption, and governance capabilities. Among the most relevant indices for the public sector are the Digital Economy and Society Index (DESI), the E-Government Development Index (EGDI) and the Global Digital Competitiveness Index (GDCI). Each of these indices provides a unique perspective on digital maturity, aiding public policy formulation and implementation.

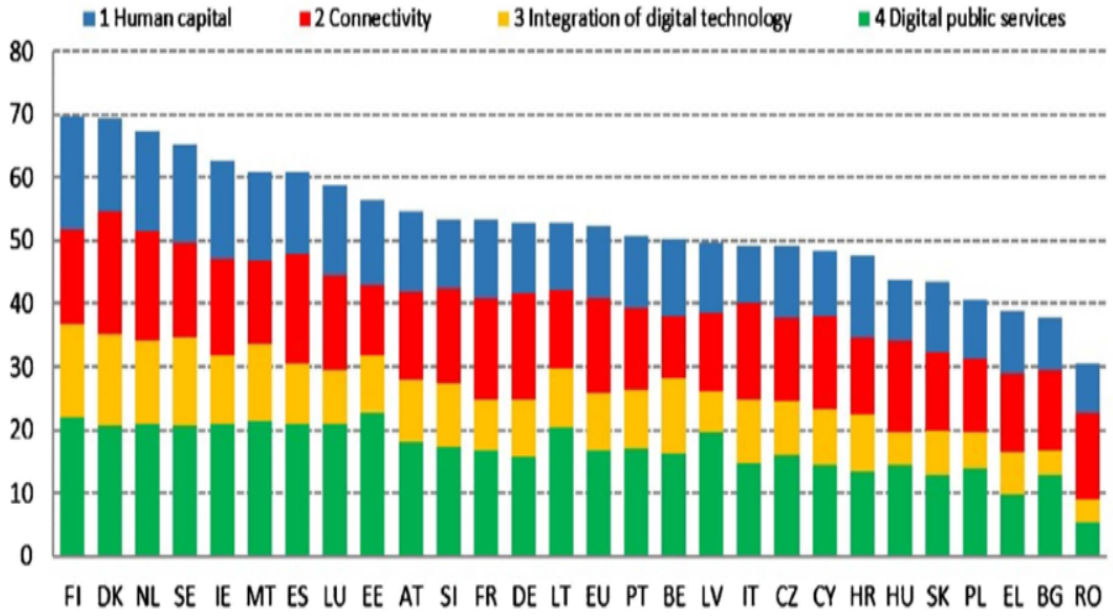
1. Digital Economy and Society Index (DESI)

The Digital Economy and Society Index (DESI) is a composite indicator developed by the European Commission to track the digital performance of EU member states. It assesses progress in five key dimensions: connectivity, human capital (digital skills), use of internet services, integration of digital technology by businesses, and digital public services (European Commission, 2023).

DESI provides valuable insights for policymakers in EU countries, enabling them to benchmark their digital progress and identify areas requiring

improvement. Countries with high DESI scores tend to have robust digital infrastructures, advanced e-government services, and widespread digital literacy (European Commission, 2022). The index also highlights disparities between member states, helping allocate resources to bridge the digital divide.

Diagram 4.3: DESI EU-members' ranking in 2022



Source: European Commission. (2022)

2. E-Government Development Index (EGDI)

The E-Government Development Index (EGDI), published by the United Nations, evaluates the digital government capabilities of countries globally. The EGDI consists of three key components: online services, telecommunication infrastructure, and human capital (United Nations, 2022).

By assessing the maturity of e-government initiatives, EGDI helps governments refine their strategies for digital service delivery. Nations scoring high on the EGDI typically exhibit strong citizen engagement in e-governance, high-quality digital public services, and well-integrated ICT policies. The index plays a crucial role in global comparisons, facilitating knowledge exchange and best practice adoption among nations (United Nations, 2020).

3. Global Digital Competitiveness Index (GDCI)

The **Global Digital Competitiveness Index (GDCI)**, published by the IMD World Competitiveness Center, assesses a country's ability to adopt and explore digital technologies to transform government and business operations. The index consists of three major factors: knowledge (talent, training, and education), technology (regulatory framework, capital availability, and IT integration), and future readiness (adaptive attitudes, business agility, and IT adoption) (IMD, 2022).

From a policy perspective, GDCI helps governments evaluate their digital governance capabilities and leadership in technology adoption. Countries that score well in GDCI exhibit strong digital transformation policies, innovation-friendly regulations, and dynamic leadership in digital governance (IMD, 2021).

The indices discussed above (along with others like Network Readiness Index of Portulans Institute) or ICT Development Index of International Telecommunication Union) serve as essential tools for assessing digital transformation in the public sector. The **DESI** provides insights specific to EU countries, while the **EGDI** offers a global perspective on e-government performance and the **GDCI** evaluates leadership and governance in digital policy. By leveraging these indices, governments can enhance digital strategies, bridge the digital divide, and foster sustainable digital governance.

4.5 COVID-19 as a Catalyst for Digital Transformation in the Public Sector

The COVID-19 pandemic acted as a global accelerator of digital transformation in the public sector. Governments worldwide were forced to rapidly transition their services to digital platforms to maintain operational continuity, ensuring citizen access to essential services during lockdowns and social distancing measures (Agostino et al., 2021). This shift was not merely an expansion of e-Government initiatives but rather a fundamental transformation of public sector structures, processes, and service delivery models (AlNuaimi et al., 2022). However, scholars continue to debate whether these changes represent genuine digital transformation or merely rapid digitalization driven by necessity rather than strategic intent (Gabryelczyk, 2020). Furthermore, research has indicated that the pandemic not only accelerated digital initiatives but also shifted

public managers' perceptions regarding the importance of digital transformation, with many now seeing information and communication technology (ICT) as a fundamental tool for economic, social, and environmental goals (Barrutia & Echebarria, 2021).

Before COVID-19, digital transformation in the public sector was gradual and uneven, with many governments still reliant on traditional bureaucratic processes. The pandemic, however, created an urgent necessity for digital service delivery, leading to:

1. **Increased Adoption of E-Government Services** – Countries expanded online services for tax payments, unemployment benefits, health records, and digital identity verification. For example, Estonia's e-Government model, already highly digitalized, became a benchmark for other nations seeking to accelerate their transition. However, the speed at which these changes were implemented sometimes compromised strategic planning and long-term sustainability, as digital transformation requires not just new technologies but also new governance models and operational mindsets (Gabryelczyk, 2020; Agostino et al., 2021). Moreover, public managers in municipalities with pre-existing smart city initiatives found it easier to adapt to digital acceleration than those in cities with limited prior investment in digital infrastructure (Barrutia & Echebarria, 2021).

2. **Remote Work Implementation** – Governments introduced cloud-based collaboration tools, allowing public employees to work remotely. The U.S. and U.K. reported an increase in teleworking, with many agencies shifting to hybrid work models. However, the transition also exposed gaps in IT infrastructure, digital skills, and business continuity planning. Many organizations lacked the preparedness needed for such a shift, relying instead on reactive rather than proactive strategies (Gabryelczyk, 2020). The forced shift to digital workspaces also changed public managers' attitudes toward technology, making them more confident in its ability to support operational efficiency in the long run (Barrutia & Echebarria, 2021).

3. **AI and Data Analytics for Decision-Making** – Governments leveraged big data analytics and artificial intelligence (AI) to track COVID-19 cases, manage vaccine distribution, and predict healthcare demand. South Korea's real-time

contact tracing system demonstrated how AI-driven governance could enhance crisis response. However, many of these AI-driven initiatives were developed as ad hoc responses to the pandemic rather than part of a broader digital transformation strategy, raising concerns about sustainability and ethical considerations (Agostino et al., 2021). Additionally, the pandemic revealed disparities in digital capabilities among public managers, as some were more adept at leveraging data-driven decision-making than others (Barrutia & Echebarria, 2021).

COVID-19 transformed the way governments engage with citizens by prioritizing digital inclusion and transparency. Key developments included:

- **Expansion of Digital Health Services** – Telemedicine services increased globally, reducing pressure on healthcare facilities. The European Union's Digital COVID Certificate facilitated cross-border travel through digital health credentials. However, while these innovations improved accessibility, they also revealed socio-digital divides, as some populations lacked the necessary connectivity or digital literacy to fully benefit from these services (Gabryelczyk, 2020). Public managers increasingly recognized the importance of bridging these digital divides, as digital transformation was no longer seen as a purely technological issue but also a social one (Barrutia & Echebarria, 2021).

- **Use of Social Media and Chatbots** – Governments turned to AI-powered chatbots and social media platforms to disseminate real-time information. India's government launched the MyGov Corona Helpdesk, an AI chatbot offering pandemic-related updates. Similarly, Italian state museums adapted to digital service delivery by leveraging social media to maintain engagement with citizens (Agostino et al., 2021). While these tools increased accessibility, they also raised challenges in content moderation, misinformation management, and maintaining user engagement over time. The role of digital communication was re-evaluated, with public managers acknowledging that it required more than just technological solutions—it demanded strategic planning and governance (Barrutia & Echebarria, 2021).

- **Participatory Governance** – Countries such as Taiwan leveraged civic tech platforms like vTaiwan to crowdsource solutions for pandemic response, demonstrating a shift towards digital democracy. However, broader public sector engagement with participatory governance remains limited, as many institutions have not fully integrated digital participation into long-term governance strategies (Agostino et al., 2021). Moreover, the pandemic highlighted the tension between increased digital surveillance for public health purposes and citizens' privacy concerns, which influenced how public managers perceived the trade-offs in digital governance (Barrutia & Echebarria, 2021).

Besides the above referred, there are several other highly-cited empirical studies on the issue. Shen et al. (2023) highlight the role of COVID-19 as a catalyst r, emphasizing how digital platforms reshaped public service provision. Their study examines the Weijiayuan platform in Jiaxing, China, demonstrating how government-sponsored digital platforms facilitated the shift from recovery resilience (the ability to restore pre-existing conditions after a crisis) to transformative resilience (the ability to adapt and innovate beyond pre-crisis conditions). The study identifies four key conditions for this transition: public entrepreneurship, critical mass of users, incentivized public service coproduction, and government accountability. Their findings underscore how digital governance platforms not only managed pandemic-related challenges but also redefined public service delivery, fostering citizen engagement and decentralized governance.

Moser-Plautz and Schmidthuber (2023) explore how the COVID-19 pandemic acted as a driver for digital transformation within the Austrian federal administration. Their study examines ten government organizations and highlights how external pressure accelerated digital transformation, influencing both technical systems (e.g., increased digitalization of services) and social systems (e.g., shifting organizational culture toward innovation). They define recovery resilience as restoring pre-existing processes and transformative resilience as adapting beyond the pre-crisis state to foster innovation. Their findings illustrate that organizations most affected by the pandemic experienced the most significant digital transformation, emphasizing the role of crises in driving public sector innovation.

Lee et al. (2023) examine the role of public-private partnerships in accelerating digital transformation in Singapore’s response to COVID-19. Their study emphasizes how

collaborative innovation between government agencies and private enterprises enabled rapid deployment of digital tools. Recovery resilience (restoring previous functions post-crisis) was evident in early containment measures, while transformative resilience (evolving beyond pre-pandemic structures to drive long-term innovation) was demonstrated through sustained ICT-driven solutions. The study underscores how whole-of-government collaborations in research, ICT, and business digitization not only mitigated crisis impacts but also established a foundation for future digital governance.

Palos-Sánchez et al. (2023) focus on the role the pandemia in advancing the United Nations' Sustainable Development Goals (SDGs). The study highlights that IT security played a crucial role in shaping government attitudes toward digital transformation during the pandemic. Local governments leveraged digital technologies to enhance public services, ensuring accessibility, efficiency, and transparency. The research underscores the importance of IT skills, budgets, and regulatory compliance in facilitating digital transformation. Ultimately, the study provides valuable insights for policymakers in improving governance and service delivery in crisis scenarios.

Lat, but not least, the article by Savchenko et al. (2024) investigates the digital transformation of public administration across EU countries in response to the COVID-19 pandemic, focusing on the pace and homogeneity of digitalization. Using cluster analysis and trend forecasting, the study identifies five distinct clusters of EU nations based on their Digital Economy and Society Index (DESI) scores, revealing significant disparities in digital transformation levels. The findings indicate that COVID-19 accelerated the adoption of e-government services, with actual usage of digital public services in 2020–2021 surpassing predictions based on pre-pandemic trends. The study also highlights how the crisis exposed gaps in digital preparedness, with countries like Romania and Bulgaria lagging significantly behind digitally advanced nations such as Denmark, Finland, and Sweden. The research suggests that EU governments must invest an estimated €75 billion annually to bridge these gaps, alongside €42 billion for digital literacy and workforce upskilling. The study underscores the pandemic’s role in catalyzing digital transformation but warns that uneven progress may hinder the EU’s broader digitalization strategy. The authors call for stronger policy coordination,

increased investments in IT infrastructure, and greater emphasis on digital inclusivity to enhance public administration efficiency and resilience in future crises.

The COVID-19 crisis redefined digital transformation in the public sector, shifting it from an optional modernization effort to a critical necessity. While many governments successfully transitioned to digital service delivery, long-term sustainability depends on investments in digital infrastructure, cybersecurity, and inclusive policies. Additionally, there is an ongoing need to differentiate between digital transformation and short-term digital adaptations. As scholars highlight, digital transformation is not just about implementing new technologies but also about rethinking public sector operations, governance structures, and service delivery models in a way that ensures long-term resilience and citizen-centric innovation (Gabryelczyk, 2020; Agostino et al., 2021). Furthermore, the shift in public managers' attitudes—where they now place greater importance on ICT alongside other societal challenges—suggests that digital transformation will remain a key priority in public administration beyond the immediate crisis (Barrutia & Echebarria, 2021).

CHAPTER 5. PUBLIC MANAGEMENT & GOVERNANCE

5.1 Digital Era Governance: Transformations, Challenges, and Future Directions

Public administration has evolved through various paradigms, each reflecting the socio-economic and technological conditions of its time. Two significant models—**New Public Management (NPM)** and **Digital Era Governance (DEG)**—have shaped contemporary governance. While NPM emerged in the late 20th century as a response to bureaucratic inefficiencies, DEG has developed more recently in response to digital transformation and the increasing role of technology in public services. This paper explores the key differences between these paradigms, examining their principles, implementations, and implications for modern governance.

5.1.1 New Public Management (NPM)

NPM arose in the 1980s as part of broader neoliberal reforms, emphasizing efficiency, accountability, and market-based principles in public administration. Its primary characteristics include:

1. **Decentralization** – Shifting responsibilities from central government to autonomous agencies or local governments.
2. **Performance Measurement** – Adoption of performance indicators and benchmarking to improve efficiency.
3. **Market Mechanisms** – Incorporation of private sector management techniques, such as outsourcing and competition.
4. **Customer Orientation** – Viewing citizens as customers and prioritizing service delivery.
5. **Managerialism** – Empowering managers with greater autonomy to make operational decisions.

These principles aimed to make public administration more business-like, reducing bureaucratic red tape and promoting cost-effectiveness. However, critics argue that NPM often led to fragmentation, reduced transparency, and an overemphasis on financial performance at the expense of broader public value.

Table 5.1: DEG vs. NPM comparison

Aspect	New Public Management (NPM)	Digital Era Governance (DEG)
Governance Model	Decentralized, market-driven	Reintegrated, digitally enabled
Service Delivery	Outsourced, competitive	Digital, user-centric
Decision-Making	Managerial autonomy, performance-based	Data-driven, evidence-based
Technology Use	Limited, efficiency-focused	Integral, transformative
Citizen Role	Customers, passive recipients	Co-creators, active participants

5.1.2 Digital Era Governance (DEG)

DEG emerged in the early 21st century as a response to the limitations of NPM and the rapid advancement of digital technologies. Governments worldwide are undergoing rapid transformations due to digital technologies. Traditional bureaucratic models are being replaced by networked, data-driven, and participatory approaches that redefine how public services are delivered. Digital Era Governance (DEG) encapsulates these changes, emphasizing efficiency, transparency, and citizen empowerment. This paragraph investigates DEG's theoretical underpinnings, practical applications, and the challenges it presents to policymakers.

Digital transformation is no longer a choice but a necessity for governments striving to meet citizens' expectations. Citizens demand seamless digital services comparable to those provided by the private sector (Andersson et al., 2022). However, achieving such transformation is complex, requiring deep structural changes in public administration and legal frameworks (Tassabehji et al., 2016). This study provides an in-depth examination of DEG by analyzing its conceptual foundations, policy implementations, real-world applications, and potential pitfalls.

Governments must rethink their service delivery models, workforce capabilities, and infrastructure to align with evolving digital demands. The shift from paper-based, siloed systems to integrated digital ecosystems has profound implications for governance, security, and accessibility (Kim et al., 2022). This article explores how DEG can create a more adaptive, inclusive, and citizen-responsive government.

5.1.3 Conceptual Foundations of Digital Era Governance

DEG emerged as a response to the inefficiencies of traditional governance models. Unlike New Public Management (NPM), which sought to introduce market mechanisms into public administration, DEG prioritizes technology-driven reforms that enhance interconnectivity and citizen participation (Pors, 2015). Three key pillars define DEG:

- **Digitalization and Automation:** Governments are increasingly adopting artificial intelligence (AI), machine learning, and blockchain to streamline administrative processes and reduce bureaucratic inefficiencies (Andersson et al., 2022).
- **Data-Driven Decision-Making:** The use of big data analytics allows for more precise policy formulation and implementation, minimizing guesswork and improving efficiency in governance (Kim et al., 2022).
- **Citizen-Centric Governance:** Digital platforms facilitate public engagement and co-creation of policies, leading to increased transparency and trust in government institutions (Plesner et al., 2018).

The digitalization of governance extends beyond automation; it signifies a shift towards proactive service delivery, where predictive analytics help governments address citizen needs before problems arise (Tassabehji et al., 2016). Data-driven decision-making enables governments to anticipate crises, optimize resource allocation, and improve citizen engagement (Gabryelczyk, 2020).

Additionally, the rise of GovTech—technology-driven solutions developed specifically for the public sector—has expanded the reach of digital governance, improving communication, service delivery, and decision-making efficiency. Many governments are embracing cloud computing, robotic process automation (RPA), and blockchain-based identity management systems to enhance public trust and operational efficiency.

5.1.4 Transformations in Public Administration

DEG has significantly altered public sector operations. Traditional bureaucracies relied on hierarchical structures, but digital governance fosters horizontal, networked interactions (Goh & Arenas, 2020). Several innovations define this transformation:

- **E-Government and Smart Services:** Online portals and automated service delivery mechanisms reduce administrative burdens and improve efficiency (Barrutia & Echebarria, 2021). Governments are moving towards fully digitized citizen interactions, reducing paperwork and wait times for essential services.

  By analyzing large datasets, governments can improve public transportation systems, healthcare services, and emergency response mechanisms. Predictive analytics in Big Data aids in optimizing traffic management and urban infrastructure planning.

  Abdeldayem & Aldulaimi examine the impact of Big Data analytics on public service delivery, with a focus on healthcare and transportation. The case study analyzes real-time hospital admission rates and urban mobility data in a smart city initiative. The methodology includes data mining techniques, predictive modeling, and interviews with healthcare and transportation officials. Results

indicate a 15% improvement in emergency response times and optimized hospital bed allocation. The study emphasizes the necessity of robust data governance frameworks to address privacy concerns and interoperability issues (Abdeldayem & Aldulaimi, 2020).

- **Interoperability of Systems:** Data-sharing frameworks enable seamless coordination among government agencies, preventing redundancy and improving service efficiency (Gabryelczyk, 2020).

- **Blockchain for Transparency:** Blockchain technology enhances the security and accountability of government transactions by providing immutable records, reducing corruption risks (Pors, 2015).

- **Digital Leadership:** Leadership and strategic vision play a crucial role in the success of digital transformation initiatives. Governments that prioritize digital literacy among civil servants achieve more sustainable transformations (Torfing et al., 2021).

- **AI in Public Services:** AI-driven solutions are revolutionizing governance by automating decision-making processes, optimizing resource allocation, and enhancing citizen interactions (Andersson et al., 2022). Digital assistants, predictive policing, and AI-powered policy analysis are now part of many government operations.

Furthermore, digital twins—virtual models that simulate real-world processes—are being implemented to optimize urban planning, disaster response, and resource management. These technologies allow decision-makers to test policy impacts in real-time before actual implementation, reducing inefficiencies and unintended consequences.

5.2 Open government and transparency

In the digital era, the concepts of open government and transparency have gained renewed significance. Open government emphasizes accessibility, accountability, and

participation, ensuring that citizens can engage with and scrutinize governmental activities. Transparency, a fundamental pillar of democratic governance, is now deeply intertwined with digital innovations such as open data platforms, participatory decision-making tools, and algorithmic accountability. This section explores the key dimensions of open government, supported by insights from contemporary research, policy analysis, and case studies from various countries.

Governments worldwide have increasingly adopted digital platforms to promote transparency, yet challenges persist. Issues such as unequal access to technology, risks of data misuse, and institutional resistance to openness hinder the full realization of open governance principles (Young, 2020). This analysis evaluates the current landscape of digital transparency, examining both opportunities and constraints while highlighting global best practices.

5.2.1 Digitalization and the Evolution of Government Transparency

The transition from paper-based to digital governance has redefined transparency. Historically, transparency was limited to legal provisions, parliamentary debates, and public reports. However, digitalization has expanded the scope of open government through:

- **Open Data Initiatives:** Governments now provide real-time access to datasets on budgets, procurement, and service delivery, allowing independent analysis and public scrutiny (Young, 2020). These initiatives empower citizens, journalists, and watchdog organizations to identify inefficiencies, track government expenditures, and expose potential corruption. However, the effectiveness of open data policies depends on government willingness to provide complete and timely datasets, as selective data release can distort public perception.

- **E-Government Platforms:** Citizens can now access services, lodge grievances, and participate in governance through online portals (Castro & Lopes, 2022). These platforms streamline bureaucratic processes, reducing administrative burdens and enhancing public engagement. Additionally, interactive features

such as public consultations, digital voting systems, and feedback mechanisms allow governments to gauge public opinion and make data-driven decisions. Nonetheless, digital exclusion remains a challenge, as marginalized populations with limited internet access may struggle to benefit from e-government advancements.

Kenosi et al. discuss open government data initiatives and their role in enhancing transparency through a case study of national open data platforms in Scandinavia. Using qualitative content analysis and user analytics, the study evaluates how citizens and businesses utilize government datasets. Findings reveal that open data promotes economic innovation and civic engagement but also raises concerns regarding data privacy and misinterpretation. The study calls for standardized data-sharing policies to maximize the benefits of open government initiatives (Kenosi et al., 2024).

- **Algorithmic Decision-Making:** AI-driven governance is being used to enhance service delivery, but concerns remain regarding opaque algorithms that affect public policies (Criado & Gil-Garcia, 2019). Automated decision-making systems are now used in areas such as social welfare allocation, law enforcement, and predictive analytics for urban planning. However, a lack of algorithmic transparency can lead to biases in decision-making, reinforcing existing inequalities and undermining public trust. Governments must implement accountability frameworks, such as explainable AI principles and external audits, to ensure fairness and transparency in algorithmic governance.

While digital tools enhance transparency, they also introduce new risks, such as data breaches and the manipulation of public information. Managing these risks requires strong legal frameworks, cybersecurity measures, and independent oversight mechanisms to prevent abuse. Furthermore, digital transformation is not uniform across nations, as disparities in infrastructure and governance culture affect the speed and effectiveness of transparency reforms. In many countries, bureaucratic inertia and political reluctance continue to delay meaningful digital integration, often due to concerns about losing centralized control over information (Hansson et al., 2015). The challenge for policymakers is to balance technological innovation with ethical

considerations, ensuring that digital transparency initiatives promote accountability without compromising privacy rights.

5.2.2 The Role of Open Data in Promoting Accountability

Open data is a cornerstone of digital transparency, providing citizens and organizations with direct access to government information. Governments worldwide have launched open data portals to make public sector information accessible, enabling greater oversight of decision-making processes. According to research on U.S. municipalities, the success of open data initiatives depends on factors such as administrative capacity, political will, and public demand for transparency (Young, 2020). Open data has proven valuable in areas such as budget tracking, public health monitoring, and law enforcement oversight, where citizens and civil society organizations can use government datasets to advocate for policy improvements.

Challenges associated with open data include:

- **Selective Disclosure:** Some governments publish data that aligns with their agendas while withholding sensitive information, limiting the potential of open data for true transparency (Ning et al., 2021). This practice undermines public trust, as citizens may perceive open data initiatives as mere symbolic gestures rather than genuine commitments to accountability. Stronger legal mandates and independent oversight bodies can help mitigate this issue by ensuring that data publication is comprehensive and impartial.

- **Data Quality Issues:** Inaccurate or outdated datasets reduce the effectiveness of transparency initiatives and can lead to misinformed public discourse (Hansson et al., 2015). Poor metadata standards, inconsistent formatting, and a lack of regular updates can hinder usability. Governments should establish standardized data management protocols to maintain the reliability and credibility of open data resources.

- **Limited Public Awareness:** Many citizens are unaware of available open data resources or lack the skills to analyze them effectively, reducing their potential

impact (Hujran et al., 2023). Without adequate data literacy programs, open data risks becoming an underutilized tool, accessible only to experts and data professionals. Public outreach campaigns, educational workshops, and collaborations with universities can help bridge this gap, fostering a more informed and engaged citizenry.

Effective open data policies require a commitment to comprehensive data release, clear data standards, and civic education programs to enhance data literacy among citizens. Furthermore, open data must be presented in accessible formats, including visual dashboards and user-friendly interfaces, to ensure that diverse stakeholders, including journalists, researchers, and advocacy groups, can utilize it effectively.

Some nations have successfully leveraged open data to combat corruption and improve governance efficiency. For instance, in Brazil, open contracting platforms have been instrumental in detecting procurement fraud and holding public officials accountable, leading to significant cost savings and increased public trust in government operations (van Dijck, 2020). Similarly, in the European Union, initiatives such as the Transparency Register provide open access to lobbying activities, reducing the risk of undue corporate influence on policymaking.

However, in other cases, transparency efforts have been met with institutional resistance, where government agencies perceive increased scrutiny as a threat rather than an opportunity for better governance (Ning et al., 2021). Bureaucratic opposition often stems from concerns about losing control over information, legal liabilities, or potential political repercussions. To overcome these barriers, governments should foster a culture of transparency by embedding open data principles into public sector norms, providing incentives for compliance, and ensuring that data release policies are backed by strong legal frameworks.

Ultimately, the effectiveness of open data in promoting accountability depends on sustained political commitment, cross-sector collaboration, and continuous investment in technological and human capacity-building.

5.3 Policy-making in the digital age

The evolution of digital technologies has fundamentally altered the landscape of policy-making. Digital tools, artificial intelligence (AI), big data, and open government initiatives have redefined how governments design, implement, and evaluate policies. In the digital age, policy-makers must navigate complex challenges, including data privacy, cybersecurity, and algorithmic biases while leveraging technology to enhance efficiency, inclusivity, and responsiveness (Gritt et al., 2024; Karampotsis et al., 2024). This section explores the transformation of policy-making, highlighting key opportunities and obstacles associated with digital governance.

Governments worldwide are shifting from traditional bureaucratic models to data-driven decision-making frameworks. However, the transition is not uniform, as digital adoption varies across regions and institutions due to resource constraints, regulatory barriers, and varying levels of digital literacy (Scupola & Mergel, 2022). This analysis examines the current state of digital policy-making, considering emerging trends, risks, and case studies from various governance models.

5.3.1 The Digitalization of Policy-Making

Traditional policy-making relied on bureaucratic structures characterized by hierarchical decision-making and lengthy deliberation processes. Digitalization has reshaped this approach in several ways:

- **Big Data and Predictive Analytics:** Governments increasingly rely on data analytics to identify trends, predict policy outcomes, and optimize decision-making (Stender et al., 2024). They use AI to analyze vast amounts of data to anticipate societal trends and policy impacts. Predictive models help in crime prevention, healthcare resource allocation, and urban planning by identifying patterns and forecasting future developments.

  Van Noordt & Misuraca examine the role of predictive analytics in public policy decision-making through a case study of AI-driven urban planning initiatives in major European cities. The methodology includes data collection from municipal databases, interviews with policymakers, and AI-driven

simulations of urban growth patterns. Results show that predictive models help optimize infrastructure planning, reduce congestion, and enhance emergency response strategies. However, the study highlights challenges such as data biases, ethical concerns, and resistance from policymakers who lack technical expertise. The findings underscore the need for integrating AI tools with participatory governance models to ensure policy effectiveness and public trust (van Noordt & Misuraca, 2022).

- **Automated Decision-Making:** AI-driven policy tools streamline administrative processes, reducing human error and improving efficiency (Clarke, 2020).
- **Smart Regulation:** Digital platforms enable real-time monitoring and enforcement of regulations, increasing transparency and accountability (Alvarenga et al., 2020).
- **Blockchain Integration:** Distributed ledger technology enhances security and traceability in governance, reducing corruption risks (Karampotsis et al., 2024).
- **Cloud Computing for Policy Implementation:** Centralized digital repositories facilitate interagency collaboration and data-driven decision-making (Yuan et al., 2023).

While digital tools enhance governance, they also introduce new challenges, such as data manipulation, misinformation, and ethical concerns surrounding AI-driven decision-making (Storozhenko et al., 2024). Ensuring the ethical deployment of digital tools requires comprehensive oversight and legal safeguards.

5.3.2 Data-Driven Decision-Making and Evidence-Based Policies

The adoption of big data analytics has revolutionized policy formulation. Governments now have access to vast amounts of real-time data, allowing for more informed decision-making, improved resource allocation, and proactive problem-solving. However, leveraging data effectively requires:

- **Robust Data Governance Frameworks:** Data collection and usage policies must align with privacy regulations and ethical considerations to protect citizens' rights and prevent misuse (Hong Nham & Ha, 2022). Additionally, governments should establish independent oversight bodies to ensure compliance with data protection laws and maintain public trust in data-driven governance.

- **Interagency Data Sharing:** Siloed data systems hinder coordination; integrated data-sharing platforms improve collaboration across government departments, enhancing efficiency and reducing redundancy in policy implementation (Yuan et al., 2023). Standardized data formats and interoperable systems are essential for seamless information exchange between agencies.

- **Citizen-Centric Data Approaches:** Ensuring that data policies prioritize public welfare rather than merely administrative efficiency is crucial for ethical governance (Hujran et al., 2023). Governments should actively engage communities in shaping data policies to ensure that their needs and concerns are addressed, promoting inclusivity in decision-making.

- **Machine Learning for Predictive Governance:** AI-driven models help forecast economic trends, social behaviors, and policy outcomes, enabling governments to take proactive measures rather than reactive responses (Schulz et al., 2020). However, biases in training data can lead to discriminatory predictions, necessitating regular model audits and human oversight.

- **Digital Twins in Policy Simulation:** Advanced modeling techniques enable governments to simulate policy impacts before implementation, reducing risks and optimizing outcomes (Scupola & Mergel, 2022). These virtual replicas of cities, economies, or infrastructures allow policymakers to test different scenarios, assess potential challenges, and refine strategies based on real-time feedback.

Despite its advantages, data-driven governance is susceptible to biases in data collection and algorithmic decision-making. Case studies from smart city initiatives reveal that poorly designed algorithms can reinforce social inequalities and

discriminatory practices, exacerbating existing disparities instead of resolving them (Profiroiu et al., 2024). Thus, policymakers must adopt transparent, explainable AI systems to ensure fairness, accountability, and public trust. Additionally, data literacy programs should be promoted to help citizens and policymakers better understand and utilize data insights effectively.

5.3.3 Citizen Engagement and Digital Participatory Governance

Digital platforms have expanded opportunities for public participation in policy-making, fostering a more inclusive and democratic governance model. Key developments include:

- **Crowdsourced Policy Design:** Online platforms allow citizens to contribute ideas and provide feedback on proposed policies, ensuring a broader range of perspectives in decision-making (Chatfield & Reddick, 2019). Some governments have successfully used participatory budgeting platforms, allowing residents to directly influence how public funds are allocated.

- **E-Consultations and Digital Democracy:** Governments use virtual town halls, live-streamed debates, and digital surveys to engage diverse communities, making governance more accessible and transparent (Kuhlmann & Heuberger, 2023). These platforms encourage marginalized groups to voice their concerns without physical or logistical barriers. However, ensuring diverse participation remains a challenge, requiring proactive outreach strategies.

- **Blockchain for Secure Public Participation:** Blockchain technology enhances trust in digital voting and citizen consultations by providing tamper-proof records of public input (Karampotsis et al., 2024). This technology reduces the risk of electoral fraud and manipulation, promoting credibility in online decision-making processes.

- **Mobile Apps for Citizen Input:** Governments have deployed interactive platforms where residents can report issues, suggest policy changes, and receive real-time responses from authorities (Hujran et al., 2023). For example, smart

city applications allow citizens to flag infrastructure issues such as potholes or streetlight failures, leading to more responsive governance.

- **Gamification in Policy Engagement:** Interactive tools and simulations encourage broader citizen participation in governance by making policy discussions more engaging and accessible (Stender et al., 2024). Gamification techniques, such as interactive policy simulators, can help citizens understand complex issues and explore different policy trade-offs.

However, digital participation is hindered by digital divides, misinformation, and exclusionary practices that marginalize certain groups. Addressing these challenges requires investment in digital literacy programs, inclusive engagement strategies, and targeted efforts to reach underrepresented communities (Hansson et al., 2015). Moreover, ensuring data security in digital participation platforms is critical to maintaining public confidence in online engagement mechanisms.

The digital engagement model implemented in Estonia demonstrates that transparent, user-friendly platforms foster higher public trust and participation in decision-making (Karampotsis et al., 2024). Estonia's e-governance framework, which includes e-residency, online voting, and digital identity verification, serves as a leading example of how technology can facilitate meaningful citizen involvement while maintaining security and transparency.

5.3.4 AI and Automation in Public Policy

AI is transforming governance by automating policy analysis, regulatory compliance, and public service delivery. Its applications span various sectors, improving efficiency and effectiveness in governance. Key areas include:

- **Predictive Analytics for Policy Impact Assessment:** AI models simulate policy outcomes before implementation, reducing risks and inefficiencies while allowing for data-driven adjustments (Schulz et al., 2020). For instance, AI-powered economic forecasting tools help governments anticipate market fluctuations and adjust fiscal policies accordingly.

- **Chatbots and Virtual Assistants for Citizen Services:** Automated systems streamline government-citizen interactions, improving accessibility, responsiveness, and operational efficiency (Gritt et al., 2024). These chatbots can handle routine inquiries, freeing up human resources for more complex issues while reducing administrative costs.

  AI-powered chatbots are revolutionizing government-citizen interactions by providing 24/7 assistance, responding to frequently asked questions, and guiding users through bureaucratic procedures.

  Androutsopoulou et al. (2019) explore how AI-powered chatbots enhance interactions between citizens and government agencies. The study focuses on a case study involving Greek government agencies, where chatbots were deployed in tax, healthcare, and municipal services. Using a mixed-methods approach, including user surveys and performance analytics, the research evaluates chatbot efficiency, citizen satisfaction, and response accuracy. Findings indicate that chatbots significantly reduce waiting times, enhance accessibility, and increase user engagement. However, challenges related to natural language processing limitations and trust issues were identified. The study concludes that AI chatbots can enhance government-citizen communication but must be supplemented with human oversight to ensure accuracy and reliability (Androutsopoulou et al., 2019).

- **AI-Driven Risk Assessments:** Machine learning algorithms assess potential social and economic risks associated with policy changes, enabling proactive crisis management (Scupola & Mergel, 2022). Governments can use these assessments to predict public reactions to new regulations and mitigate unintended consequences.

- **Fraud Detection and Compliance Monitoring:** AI-powered tools help detect regulatory violations in financial and environmental policies, reducing manual oversight burdens and improving enforcement efficiency (Clarke, 2020). For example, AI-driven monitoring systems can track industrial emissions in real-time, ensuring compliance with environmental regulations. AI algorithms detect

anomalies in financial transactions and tax filings, aiding in fraud prevention and regulatory compliance.

Kenosi et al. explore how AI is used in fraud detection and regulatory compliance monitoring within tax administration agencies. The case study focuses on the use of machine learning algorithms in detecting fraudulent tax returns in a national tax authority. Researchers analyzed real-world datasets from tax audits, applying anomaly detection models and regression analysis. The study found that AI systems detected fraudulent claims with 92% accuracy, reducing manual auditing efforts by 40%. However, challenges related to model transparency and algorithmic biases were noted. The study concludes that AI has great potential in fraud prevention but requires continuous oversight to address ethical and fairness concerns (Kenosi et al., 2024).

- **Natural Language Processing for Legislative Drafting:** AI assists in analyzing public comments, legislative texts, and policy documents to draft laws based on textual analysis, ensuring that proposed regulations reflect public input and legal precision (Yuan et al., 2023). AI-powered text analysis tools can also detect inconsistencies and potential loopholes in legislation, reducing legal ambiguities.

- **Automated Document Processing**: AI-driven systems facilitate the automatic categorization and processing of documents, reducing administrative workload and improving operational efficiency in public administration.

Despite these advantages, AI governance presents ethical dilemmas, particularly regarding transparency, accountability, and algorithmic fairness. Biases in AI training data can lead to discriminatory policy outcomes, disproportionately affecting vulnerable populations. Regulatory frameworks must be established to ensure AI systems align with democratic values and human rights, fostering trust in automated decision-making (Storozhenko et al., 2024).

To address these concerns, governments should implement AI ethics boards to review and audit AI-powered policy decisions, preventing unintended biases and ensuring compliance with ethical standards (Alvarenga et al., 2020). Furthermore, AI algorithms

should be designed with explainability features, allowing policymakers and citizens to understand how decisions are made.

Policy-making in the digital age is characterized by rapid technological advancements, shifting governance models, and evolving public expectations. While digital tools offer unprecedented opportunities for efficiency, transparency, and participation, they also introduce complex challenges that require careful management. By embracing data-driven decision-making, fostering citizen engagement, and ensuring ethical AI governance, policymakers can create more responsive and inclusive governance systems. The future of digital policy-making depends on striking a balance between innovation and regulation, ensuring that technological advancements serve the broader interests of society while upholding democratic principles. Additionally, continuous investment in digital infrastructure, cybersecurity, and human expertise is essential to sustain the benefits of digital transformation in governance.

5.4 Global approaches to Open Government and Digital Policy-Making

The digital transformation of public administration has led to the emergence of E-Government and GovTech initiatives aimed at enhancing efficiency, transparency, and citizen engagement. E-Government encompasses the use of digital technologies to improve public service delivery, while GovTech represents the application of emerging technologies such as artificial intelligence (AI), blockchain, and big data to innovate government functions. These initiatives address critical challenges in governance, including bureaucratic inefficiencies, lack of transparency, and limited citizen participation (Mergel et al., 2019; AlNuaimi et al., 2022).

AI-Powered Government Services

Artificial Intelligence has revolutionized public service delivery through AI-powered chatbots and virtual assistants. A study on AI-guided chatbots in government agencies demonstrated significant improvements in communication efficiency and accessibility

(Androutsopoulou et al., 2019). The research involved collaboration with three Greek government agencies—the Ministry of Finance, a social security organization, and a local government entity. The chatbot system provided automated assistance for pension applications, guiding citizens through eligibility criteria and form submission processes. The study employed Media Richness Theory to analyze chatbot effectiveness and highlighted the importance of hybrid AI-human interaction models.

Blockchain for Transparency and Security

Blockchain technology is increasingly being adopted to enhance transparency and security in public administration. By enabling decentralized and tamper-proof record-keeping, blockchain reduces fraud and ensures data integrity in areas like land registry, digital identity verification, and financial transactions (Criado & Gil-Garcia, 2019). A case study from Estonia's e-Residency program exemplifies the successful implementation of blockchain in government services. Estonia has leveraged blockchain to secure national health records, judicial processes, and e-voting systems, establishing itself as a global leader in digital governance. This adoption has resulted in reduced bureaucracy, improved security, and enhanced citizen trust in digital services.

Big Data for Policy-Making

The utilization of big data analytics allows governments to make informed policy decisions based on real-time insights. An empirical study on the UAE public sector demonstrated that organizations that adopted data-driven decision-making experienced higher efficiency in digital transformation initiatives (AlNuaimi et al., 2022). The study used Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze survey data from 513 public sector employees, revealing that digital leadership and organizational agility significantly influence digital transformation outcomes. By leveraging big data, policymakers can detect trends, predict service demand, and allocate resources more effectively, ultimately leading to improved governance.

Smart Cities and IoT Integration

Smart city initiatives represent a significant advancement in GovTech, leveraging IoT-enabled infrastructures to optimize urban planning and resource management. The implementation of a **Digital Twin** for urban planning in Zurich serves as a benchmark

case (Schrotter & Hürzeler, 2020). This initiative integrates real-time data from IoT sensors with 3D spatial models, allowing policymakers to simulate urban development scenarios. The project aims to improve environmental sustainability by enhancing traffic management, optimizing energy consumption, and promoting citizen engagement through open-data platforms. By enabling real-time monitoring, IoT technologies also enhance public safety, improve air quality management, and streamline waste collection services.

Energy Efficiency in Public Buildings

Another application of GovTech is the use of machine learning to optimize energy consumption in public sector buildings. The **MERIDA** system, developed in Croatia, integrates IoT sensors and big data analytics to predict energy usage and recommend efficiency measures (Zekić-Sušac et al., 2021). The study involved a dataset from over 17,000 public buildings and employed three machine learning models—Deep Neural Networks (DNN), Recursive Partitioning (Rpart), and Random Forest (RF). Results indicated that RF was the most effective model, reducing energy costs and supporting sustainability goals. By integrating these technologies, governments can lower energy expenditures, reduce carbon footprints, and improve overall sustainability efforts.

GovTech initiatives are transforming public administration, offering innovative solutions to enhance efficiency, transparency, and citizen engagement. By addressing key challenges and implementing strategic policies, governments can ensure a sustainable and inclusive digital transformation.

To fully realize the potential of E-Government and GovTech, policymakers should consider the following strategies:

- **Investing in AI and Automation:** Expanding AI-driven chatbots and robotic process automation can enhance efficiency in government workflows. Automating repetitive tasks allows public servants to focus on higher-value responsibilities, reducing operational costs and improving service delivery.
- **Enhancing Cybersecurity Measures:** Implementing robust data encryption, multi-factor authentication, and AI-driven threat detection systems can mitigate cybersecurity risks. Proactive cybersecurity strategies ensure the resilience of

digital infrastructures and protect sensitive citizen information from cyberattacks.

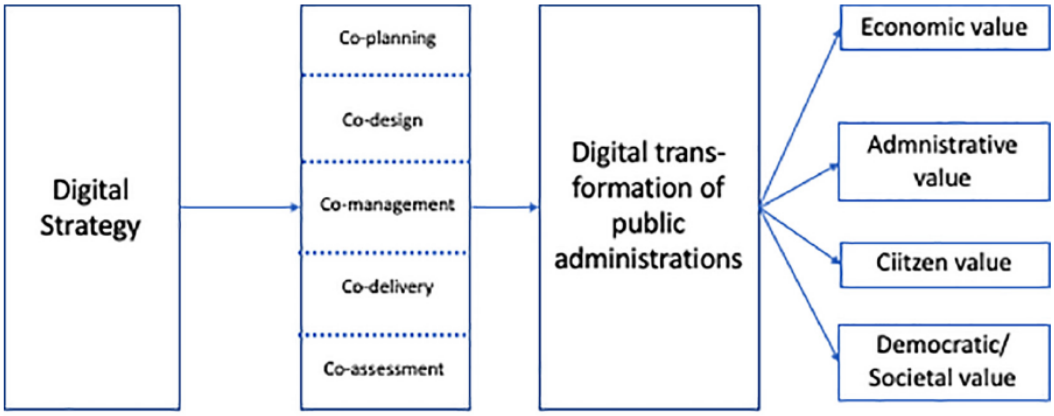
Examining real-world DEG's implementation across different countries provides insights into best practices and challenges.

5.4.1 Co-production in Public Administration and Public Value Creation in Denmark

Denmark's digital transformation of public administration serves as an exemplary case of how co-production—collaboration between governments, citizens, businesses, and other stakeholders—enhances service delivery and public value. The country's success, reflected in its top-ranking e-government status, is driven by integrated digital policies, active citizen engagement, and cross-governmental collaboration. This study investigates how co-production is implemented in Denmark's digital strategies, the key actors and tools involved, and the types of public value generated.

The research of Scupola & Mergel (2022), based on qualitative methods such as expert interviews and policy analysis, frames digital transformation as a holistic shift in governance that requires organizational change, stakeholder engagement, and regulatory adaptation. Co-production in public administration involves shared responsibility in designing and delivering services, moving beyond mere participation to active collaboration. This process unfolds in phases: co-planning, co-design, co-management, co-delivery, and co-assessment. Public value in digital government is categorized into four types: economic (efficiency and cost savings), administrative (improved service delivery), societal (trust and partnerships), and citizen-focused (transparency and accessibility).

Diagram 5.1: Conceptual framework of digital co-production and public value



Source: Scupola & Mergel (2022)

Denmark's digital transformation, spearheaded by entities like the Danish Business Authority (DBA), exemplifies how co-production is embedded at all levels of governance. National digital strategies are developed through collaboration among ministries, municipal agencies, and private-sector partners, supported by mechanisms such as task forces, advisory committees, and public-private partnerships. Key projects, such as the Virk.dk portal, the Central Business Register, and the Form Builder tool, illustrate how digital services are streamlined to enhance efficiency and user experience. The co-production process ensures that services are designed with input from businesses and citizens, delivered through integrated platforms, and continuously refined through feedback loops.

Denmark's success in digital transformation is attributed to strong multi-level governance, early stakeholder involvement, public-private partnerships, agile regulatory frameworks, and data-driven decision-making. However, challenges persist, including budget conflicts, user reluctance to engage in early service design, inter-agency collaboration barriers, and competing stakeholder interests. Despite these challenges, Denmark's approach has demonstrably improved public value by reducing government spending, increasing business efficiency, automating workflows, fostering trust, and providing more personalized digital services.

The study concludes that co-production is crucial for effective digital transformation in public administration. Denmark's model provides valuable insights for other governments aiming to enhance service efficiency, adopt user-centered digital design, implement sustainable co-financing models, and leverage partnerships for innovation.

Policy recommendations emphasize the need for holistic co-production approaches, agile regulatory support, investment in citizen engagement, and strengthened cross-agency collaboration.

Table 5.2: Types of public value

Type of Public Value	Examples from DBA's Digital Transformation
Economic Value	Reduced government spending, increased business efficiency.
Administrative Value	Automated workflows, improved data-sharing between agencies.
Societal Value	Increased trust in government, improved regulatory transparency.
Citizen Value	Personalized digital services, reduced bureaucracy, real-time access.

While offering significant empirical insights, the study acknowledges its limitations, including its focus on a single case (Denmark), a relatively small sample size, and an emphasis on business-oriented services over social sectors like healthcare. Future research could explore comparative models in other countries, long-term impacts of Denmark's policies, and quantitative evaluations of co-production's effectiveness.

Ultimately, Denmark's experience highlights that successful digital transformation requires integrating technology with citizen-centric governance. By fostering multi-stakeholder collaboration, ensuring regulatory flexibility, and prioritizing public value, governments can navigate digital transformation challenges while maximizing societal benefits.

5.4.2 Open data in U.S cities

Young (2020) examines the implementation of open data platforms in U.S. cities, focusing on the factors that influence their adoption. While digital governance is often associated with improved transparency and efficiency, the research highlights institutional and political barriers that affect implementation. Using data from over 1,500 municipal departments across 60 cities, the study employs hierarchical negative binomial regression analysis to assess how organizational characteristics shape open data initiatives. The findings challenge the assumption that citywide policies alone drive success, showing that department-level factors play a more significant role.

The study is framed within the Digital-Era Governance (DEG) model, which emphasizes service digitization, reintegration of public sector processes, and a return to centralization. Open data aligns with DEG principles by making government data publicly accessible, allowing citizens and businesses to generate insights. However, implementation varies across departments, influenced by administrative capacity, department mission, and external political pressures.

The research finds that not all municipal departments contribute equally to open data initiatives. Economic development departments, such as planning and permitting, publish the most data, while administrative departments, like HR and finance, contribute less. Departments with more managerial staff are more likely to implement open data policies, whereas citywide factors like the presence of a Chief Data Officer or centralized IT team have little impact. The study also finds no significant difference in implementation between council-manager cities and strong mayor cities.

Demand-side factors play a crucial role, with cities having a higher concentration of tech firms and educated residents publishing more open data. However, disparities emerge in access to open data, with cities that have higher unemployment rates and lower median incomes releasing more files, while those with larger non-Hispanic Black populations publish fewer. This raises concerns about racial and economic inequalities in government transparency.

The findings suggest that open data adoption is driven primarily by department-level strategies rather than top-down mandates. City governments appear to prioritize open

data for economic development over transparency and citizen engagement. Departments may resist open data initiatives due to fears of public scrutiny, data privacy concerns, or resource limitations. Legal and administrative constraints also hinder data-sharing efforts.

In conclusion, the study recommends that public managers focus on department-specific strategies to ensure successful open data adoption. Strong administrative capacity at the department level is crucial, as citywide policies alone are insufficient. Open data initiatives tend to favor economic development, with transparency-related departments lagging behind. Cities with more tech-savvy populations demonstrate higher levels of open data adoption, suggesting that public demand plays a critical role. However, the presence of racial and socioeconomic disparities in data availability underscores the need for policies that ensure equitable access to government transparency initiatives.

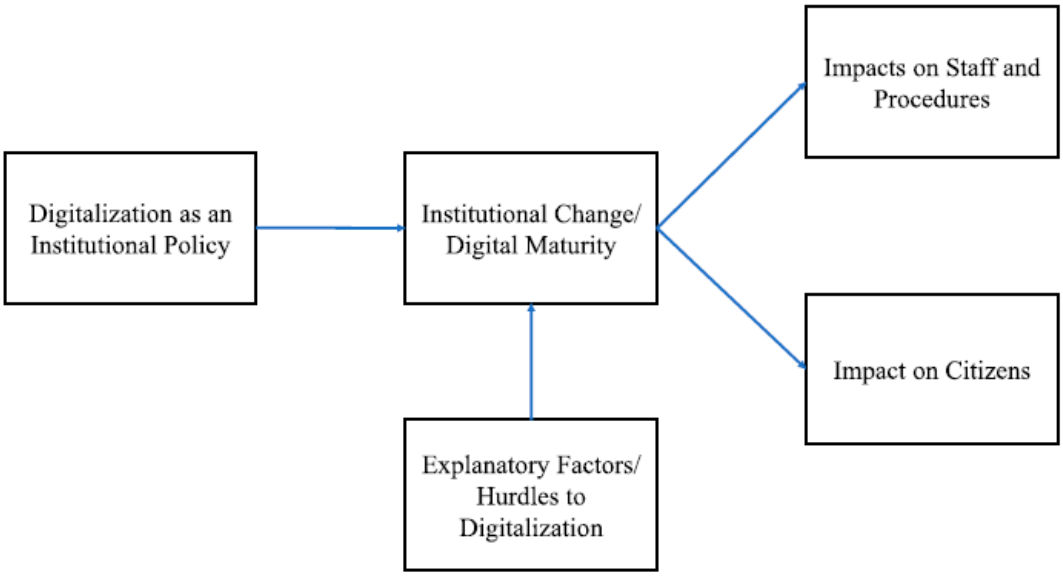
5.4.3 Digitalization in German local authorities

Kuhlmann and Heuberger (2023) explore the state of digital transformation in German local governments, analyzing both its intended and unintended consequences. The authors focus on the challenges of implementing digital services, emphasizing institutional changes, the impact on public employees, and citizen reactions.

The study builds upon Post-New Public Management (NPM) reforms, digital government maturity models, and an impact assessment framework to examine how digitalization has affected governance structures, staff workloads, and citizen engagement. The research questions center around institutional changes, the effects on employees and citizens, and the key factors influencing digital transformation outcomes.

Using a mixed-methods approach, the study combines a survey of 721 municipalities, case studies in three German cities (Bochum, Mannheim, Karlsruhe), and Structural Equation Modeling (SEM) to assess digitalization's progress and constraints.

Diagram 5.2: Assessing impacts of digitalization in the local public sector



Source: Kuhlmann and Heuberger (2023)

The key findings reveal that most municipalities have low digital maturity, with online transaction services still limited. While digital tools were expected to improve efficiency, staff members reported increased workloads, job insecurity, and usability issues. From a citizen perspective, adoption rates for digital services remain low, with younger users embracing them more than older generations. However, many citizens found online interactions cumbersome, with features like digital signatures and integrated payments often missing.

The study identifies four major barriers to digital transformation:

1. **Governance constraints**, such as decentralized decision-making and a lack of strategic leadership.

2. **Legal constraints**, including mandatory in-person procedures and strict data protection laws.

3. **Technological and usability constraints**, with outdated IT systems and services not designed with users in mind.

4. **Resource constraints**, including financial limitations and a shortage of IT specialists in the public sector.

The article concludes that Germany lags behind in local digital governance, ranking 21st out of 28 European countries in e-government implementation. Without better coordination, funding, and legal reforms, digital transformation will remain fragmented and ineffective. The authors recommend further research to compare governance models and identify best practices to overcome these barriers.

Overall, the study provides a critical assessment of the disconnect between digital policies, implementation, and user experience in Germany's local governments. It highlights major gaps in digital government maturity and offers practical recommendations for improving administrative digitalization.

5.4.4 Configuration of work during automation in Sweden

Andersson et al. (2022) examine how digitalization reshapes public administration work by focusing on the implementation of Robotic Process Automation (RPA) in a Swedish local government. While much of the existing research emphasizes the effects of automation on efficiency and service quality, this study takes a different approach, analyzing how digitalization unfolds in practice. The authors introduce the concept of **"configuring work,"** which describes how technology, roles, materials, discourses, and power structures interact to shape automation processes. The study seeks to understand how public administrators adapt to and influence automation, why automation can reduce professional autonomy and service quality, and how power dynamics and organizational discourse shape digital transformation.

Drawing from previous scientific work, the authors define three key aspects of configuring work: **nudging, simplifying, and aligning.** Nudging refers to how policy objectives and automation narratives shape the project's direction. Simplifying involves breaking down complex human tasks into algorithmic processes, often omitting discretion and social interaction. Aligning highlights how technology is adapted to fit bureaucratic structures rather than fundamentally transforming them.

The research is based on a two-year ethnographic case study (2018–2021) in a Swedish municipality implementing RPA in social services. Data collection included observations of key project meetings, 15 interviews with stakeholders, and an analysis

of 21 internal project documents. The case study focuses on the automation of benefit processing, particularly applications for digital safety alarms—devices that notify caregivers in emergencies. Swedish municipalities manage social benefits under national laws, and digitalization is positioned as a strategy to reduce administrative burdens and enhance efficiency.

The automation project aimed to replace human caseworkers with software robots to process applications. However, delays due to procurement issues extended the project timeline beyond the initial one-year plan. A digital strategist and project manager led the initiative, with oversight from a steering committee. The chosen technology, Robotic Process Automation (RPA), was designed to mimic human decision-making in digital workflows by processing data from multiple systems. Unlike artificial intelligence, RPA does not learn independently but operates based on predefined rules and algorithms.

The study's findings are structured around the three aspects of configuring work. **Nudging** shaped the project narrative, emphasizing efficiency and speed while downplaying concerns about job roles and service quality. Managers framed automation as a way to free up case officers for "more valuable tasks," avoiding the term "robot" to reduce resistance. However, this framing prevented critical discussions on whether automation genuinely improved service quality. **Simplifying** involved breaking down work into discrete, sequential steps that could be codified into RPA algorithms. Case officers participated in process-mapping workshops, defining their tasks using post-it notes and whiteboards. Yet, the automation process excluded essential human elements such as empathy and judgment, raising concerns about diminishing service quality. **Aligning** reflected how technology was adjusted to fit bureaucratic structures rather than improving service delivery. Case officers worried about the lack of human oversight in automated decisions, but instead of redesigning the process, project managers opted for superficial fixes, such as adding text instructions. The project treated technological limitations as constraints, adapting human work to fit the RPA's logic rather than the other way around.

The study's discussion highlights that automation does not simply replace human work but reshapes it. Digitalization in the public sector often **restricts professional discretion, prioritizes efficiency over service quality, and reinforces managerial**

control over frontline workers. Case officers lost autonomy over service delivery, while automation's focus on standardization risked neglecting citizens needing personalized support. The power dynamics of digitalization favored managers, limiting employees' ability to influence the process.

The authors conclude that **the success of public service automation depends not only on the technology itself but on how it is implemented.** Digital transformation should actively involve frontline workers to preserve service quality. Pre-implementation phases should be carefully managed to avoid an overemphasis on efficiency at the expense of meaningful public service. Future research should explore alternative digitalization strategies that balance technological efficiency with human discretion.

This study contributes to digital transformation literature by offering a **critical perspective on automation's impact on public administration.** It emphasizes how power structures and organizational discourse shape digitalization outcomes and introduces **"configuring work"** as a valuable framework for analyzing digital transformations. The findings challenge the assumption that automation inherently improves service delivery, arguing instead that its effectiveness depends on whether it is designed to integrate with human work rather than simply replace it.

5.4.5 Canada: Know-How to lead digital transformations in local governments

Pittaway & Montazemi (2020) explore the challenges local governments face in implementing digital transformation, emphasizing the managerial know-how necessary to achieve it. Despite the advantages of digital technologies in public service delivery, progress has been slow because managers often lack the expertise to replace legacy systems with integrated enterprise solutions. To address this issue, the study examines case studies from eleven Canadian local governments, identifying key areas of knowledge required for transformation and proposing a model for knowledge transfer through public-private partnerships.

Digital transformation involves integrating digital technologies to optimize organizational structures and service delivery. Governments that successfully

implement digital transformation experience increased efficiency and improved service outcomes. However, many local governments continue to operate with fragmented IT systems, leading to inefficiencies, redundancies, and poor interdepartmental collaboration. The research highlights that to overcome these challenges, governments must implement integrated enterprise systems. Yet, only ten percent of local governments had achieved this due to a lack of managerial expertise in leading such initiatives.

The study applies Punctuated Equilibrium Theory, which describes organizational change as occurring in sudden, disruptive phases rather than gradual progressions. Local governments often resist change due to entrenched bureaucratic processes and outdated IT systems. The research identifies four key dimensions that must be transformed for successful digital change: organizational strategy, IT strategy, organizational structure, and IT governance. A major obstacle to transformation is that managers are often bound by old cognitive frameworks, which prevent them from fully embracing new ways of operating.

The researchers conducted case studies of eleven local governments that had implemented enterprise systems over a decade ago. Their methodology included interviews with Chief Information Officers, analysis of budget documents, and assessments of IT governance structures. The study classified these governments into three categories. One government had fully transformed, successfully integrating enterprise systems and enacting new digital processes. Three governments had partially transformed, integrating enterprise systems but failing to implement them fully across all departments. Seven governments remained largely unchanged, continuing to use fragmented IT systems with little progress.

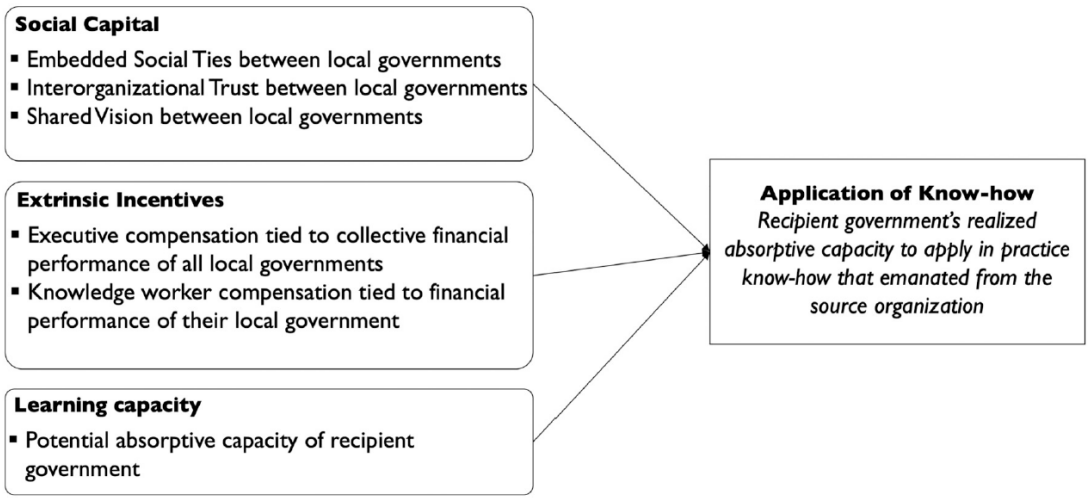
The key factor differentiating successful digital transformation from stagnation was the ability of local governments to leverage trigger events such as political crises, new leadership, and public demand to drive rapid change. The government that successfully transformed had shifted from a cost-cutting strategy to an innovation-driven approach, invested heavily in employee training, and implemented a collaborative IT governance model where CIOs and senior managers worked together on strategic decisions. It also promoted a shared vision for digital innovation, breaking old cognitive frameworks that had previously hindered transformation.

In contrast, the governments where digital transformation had stagnated exhibited resistance to change due to deeply rooted bureaucratic structures. They failed to invest in employee training and digital literacy, allowing IT decisions to be made in isolation by individual departments rather than through a centralized IT governance system. Their focus remained on incremental improvements rather than fundamental transformation, preventing them from achieving the full potential of digital services.

The study proposes a model for transferring knowledge to local government managers through public-private partnerships. This model involves collaboration with IT service providers to bring technical expertise, peer local governments to share best practices, and universities to offer specialized training programs. Knowledge transfer is essential because digital transformation is not simply about adopting new technologies but requires a fundamental shift in managerial knowledge, organizational culture, and governance structures.

The research offers several recommendations to bridge the knowledge gap. Local governments should form partnerships with IT service providers to ensure that enterprise systems are designed to meet public sector needs. They should also consider outsourcing IT expertise while focusing on strategic decision-making. Municipalities must collaborate to create knowledge-sharing networks where successful cases can guide those struggling with digital transformation. Higher-tier governments should introduce performance-based incentives to encourage local governments to adopt best practices. Universities should play a role in developing an integrated knowledge base specific to digital governance and offer executive education programs to train government leaders in digital transformation strategies.

Diagram 5.3: Proposed model of peer-to-peer transfer of know-how to local governments.



Source: Pittaway & Montazemi (2020)

The study concludes that digital transformation in local governments requires more than just technology adoption. It demands a fundamental rethinking of management practices, leadership strategies, and governance structures. Without the necessary know-how, digital initiatives are likely to stall. By fostering a culture of continuous learning and leveraging knowledge-sharing networks, local governments can overcome existing barriers and achieve meaningful digital transformation. The research contributes to both academic theory and public policy by providing a dynamic model of digital change, an empirical theory of the managerial know-how required, and a roadmap for knowledge transfer to facilitate successful implementation.

CHAPTER 6. ORGANIZATIONAL CHANGE & INNOVATION

6.1 Digital leadership and culture in public organizations

The digital age has transformed the landscape of public administration, necessitating new forms of leadership and cultural adaptation. Digital leadership in public organizations encompasses strategic decision-making, fostering an innovation-driven culture, and navigating challenges associated with digital transformation (Brunetti et al., 2020; Torfing et al., 2021). The success of digital initiatives depends not only on the adoption of advanced technologies but also on the ability of leaders to inspire change, upskill the workforce, and manage resistance (Barrutia & Echebarria, 2021). This section explores the evolving role of leadership in digital governance, the cultural shifts required, and the challenges faced by public institutions in embracing digital transformation.

Table 6.1: Organizational aspects influenced by digital government transformations

Organizational aspects	Definition	Examples
Tasks & Processes	Characteristics of the tasks and processes	Level of client interaction, level of standardization, type of task
Individual	Characteristics of the individual's duties and competences needed to perform the task	Attitudes toward using technology, technological knowledge, experience with digital services
Resources & Structures	Characteristics of the organizational resources and structures available to perform the task	Availability of infrastructure, management and political support, financial resources, strategy for digital transformation, system integration
Culture	Organizational regulations and values	Communication within and between government units, leadership culture, internal pressure

Source: Moser-Plautz & Schmidtthuber (2023)

Public organizations operate within bureaucratic structures that often resist rapid change. Unlike the private sector, where agility and competition drive digital

advancements, government institutions must balance efficiency, security, and public accountability (Tassabehji et al., 2016). Digital leadership, therefore, involves not only implementing technology but also fostering a digital mindset that aligns with organizational goals and public expectations.

6.1.1 The Role of Digital Leadership in Public Organizations

Digital leadership in the public sector differs from traditional leadership due to its focus on fostering technological adaptation, driving innovation, and ensuring ethical digital governance. Digital leaders must possess:

- **Strategic Vision and Digital Literacy:** Leaders need a comprehensive understanding of emerging digital technologies, including artificial intelligence (AI), blockchain, and big data analytics. This knowledge enables them to anticipate technological trends and develop long-term digital strategies that align with institutional goals (Shen et al., 2023). Without digital literacy, public sector leaders may struggle to implement and oversee transformation initiatives effectively.

- **Change Management Skills:** Unlike traditional leadership, digital leadership involves navigating uncertainty and resistance within bureaucratic structures. Public sector employees often face apprehension regarding automation, job security, and the learning curve associated with digital tools. Leaders must implement structured change management programs, provide transparent communication about transformation objectives, and offer continuous support to employees adapting to digital workflows (Kim et al., 2022). Change-resistant organizations often fail to capitalize on digital innovations, leading to inefficiencies and stagnation.

- **Agile Governance Approaches:** In an era where technology evolves rapidly, rigid policy frameworks may impede effective governance. Digital leaders must advocate for agile governance models that allow iterative policy-making, real-time adjustments based on data insights, and pilot programs to test new initiatives before full-scale implementation (Klochan et al., 2021). The ability

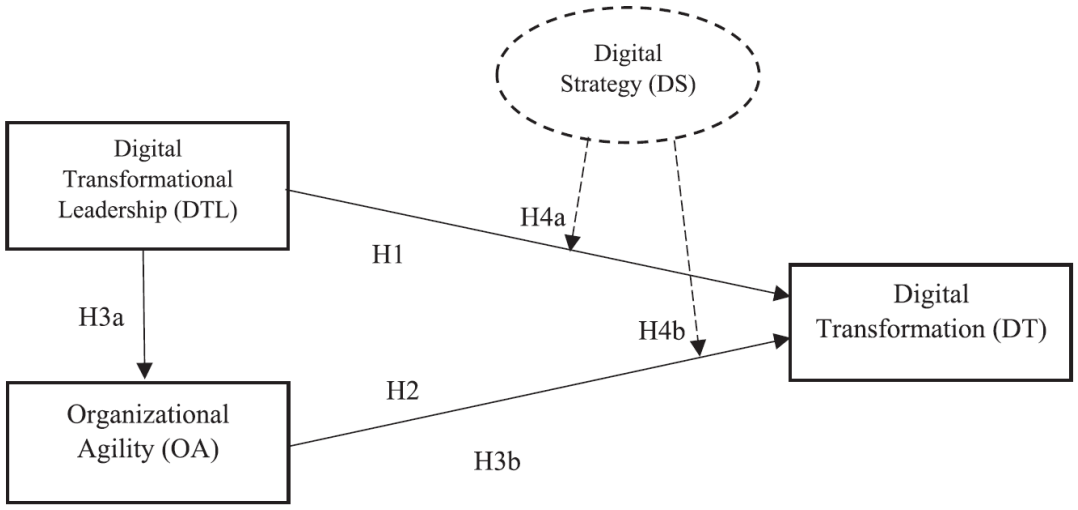
to pivot and modify strategies ensures that public institutions remain responsive to technological advancements and societal needs.

- **Data-Driven Decision-Making:** Traditional governance relied on intuition and past experiences, whereas digital leadership requires leveraging data analytics for informed policy-making. Leaders must understand data collection methodologies, data ethics, and predictive modeling to ensure evidence-based decision-making (Barrutia & Echebarria, 2021). A failure to integrate data-driven approaches can result in inefficient policies that do not address citizen needs effectively.

- **Ethical Leadership in Digital Governance:** The increasing reliance on AI, automation, and data analytics raises ethical concerns regarding transparency, bias, and privacy. Digital leaders must champion ethical frameworks that prioritize citizen rights, ensure algorithmic accountability, and establish safeguards against data breaches (Tassabehji et al., 2016). Without ethical leadership, digital transformation efforts risk exacerbating social inequalities and eroding public trust.

The study of AlNuami et al. (2022) confirms that digital transformational leadership and organizational agility are key drivers of successful digital transformation in public sector organizations. Leaders who inspire digital adoption and foster trust positively impact transformation efforts (H1). Organizational agility also plays a crucial role, enabling quick adaptation to regulatory and technological changes (H2). Additionally, agility mediates the relationship between leadership and transformation, meaning that leadership fosters agility, which in turn enhances digital transformation outcomes (H3b). However, digital strategy did not moderate these relationships (H4a, H4b), suggesting that strategy alone is insufficient without strong implementation and employee engagement (See diagram 6.1). The study highlights the need for transformational leaders, cultural adaptation, and streamlined bureaucracies to enhance agility and ensure effective digital transformation in the public sector. It also emphasizes that digital transformation is not just about technology but requires a shift in mindset, proactive leadership, and an adaptable workforce.

Diagram 6.1: Nexus between leadership, agility, and digital strategy



Source: AlNuaimi et al. (2022)

6.1.2 Key Competencies and Role of Digital Leaders

Effective digital leaders must cultivate a set of core competencies that enable them to successfully manage digital transformation in public organizations. These competencies include:

- **Digital Fluency:** Leaders must be able to interpret and apply digital trends to organizational strategies, ensuring that technological advancements align with policy objectives (Torfing et al., 2021). Digital fluency also includes the ability to engage with IT teams, data scientists, and policymakers to bridge the gap between technology and governance.

- **Innovation and Adaptability:** The ability to drive innovation and embrace technological change is a critical trait of digital leaders. This requires a mindset that encourages creative problem-solving, open collaboration, and the ability to experiment with emerging digital tools (Brunetti et al., 2020). Adaptability ensures that organizations remain flexible in the face of evolving digital landscapes.

- **Resilience and Crisis Management:** Digital leaders must be prepared to manage crises, particularly those related to cybersecurity threats,

misinformation, and system failures (Klochan et al., 2021). Resilience involves developing contingency plans, ensuring robust IT security frameworks, and leading the organization effectively through digital disruptions.

- **Collaboration and Interdisciplinary Coordination:** Digital transformation often requires cross-functional teamwork. Leaders must foster a culture of collaboration between different government agencies, private technology partners, and research institutions to create cohesive digital strategies (Kim et al., 2022). Successful digital projects require cooperation between policymakers, legal experts, technologists, and citizens.

- **Citizen-Centric Approach:** Public sector digital leaders must ensure that digital policies enhance the lives of citizens. This requires engaging with the public through digital platforms, collecting feedback, and implementing policies that prioritize accessibility, inclusivity, and user experience (Tassabehji et al., 2016). Without a citizen-centered approach, digital transformation efforts may fail to address real societal needs.

6.1.3 Leadership Theories and Their Relevance to Digital Transformation

Several leadership theories provide insights into how digital leaders can drive transformation in public organizations. These theories highlight different approaches that can be adapted to the unique challenges of digital governance:

- **Transformational Leadership:** Transformational leaders inspire and motivate employees to embrace change and align with the organization's vision. In digital governance, transformational leaders encourage innovation, create a culture of learning, and empower employees to develop digital competencies (Torfing et al., 2021). By fostering an environment that values technological curiosity and proactive problem-solving, transformational leaders ensure that digital initiatives are met with enthusiasm rather than resistance.

- **Servant Leadership:** Servant leadership emphasizes the leader's role in serving their employees and ensuring their well-being. In the digital era, this approach

involves providing employees with the necessary tools, training, and support to navigate technological shifts (Shen et al., 2023). Public sector leaders practicing servant leadership prioritize user-centric digital services, ensuring that digital policies enhance accessibility and inclusivity for all citizens.

- **Distributed Leadership:** Digital transformation requires collaboration across multiple departments and stakeholders. Distributed leadership, which involves delegating responsibilities and fostering collective decision-making, ensures that digital initiatives are not confined to a single department but are embraced organization-wide (Nielsen et al., 2024). Public organizations that adopt distributed leadership models encourage cross-functional teams to work together on digital projects, leading to more holistic and effective transformation efforts.

- **Adaptive Leadership:** Given the fast-paced nature of technological advancements, adaptive leadership is particularly relevant in digital governance. Adaptive leaders remain flexible, experiment with new approaches, and adjust strategies based on emerging challenges (Kim et al., 2022). This theory is crucial in the public sector, where leaders must balance regulatory constraints with the need for continuous innovation.

6.1.4 Cultivating a Digital Culture in Public Administration

Transforming organizational culture is essential for digital transformation in public organizations. A digital-first culture is characterized by:

- **Encouraging Risk-Taking and Experimentation:** Traditional bureaucratic structures discourage experimentation due to the fear of failure. A digital culture must embrace iterative development, allowing small-scale pilot programs to test new technologies before full implementation (Nielsen et al., 2024). Leaders must create an environment where employees feel safe to experiment without fear of severe repercussions for failure.

- **Fostering Collaboration and Open Innovation:** Digital transformation thrives in environments where knowledge-sharing and cross-sector partnerships are encouraged. Public sector leaders should facilitate collaboration between government agencies, academia, and private industry to co-develop digital solutions (Torfing et al., 2021). The open-source movement in digital governance has demonstrated how transparency and shared innovation can accelerate progress.

- **Upskilling the Workforce:** Investing in digital skills training ensures that employees can effectively navigate new technologies. Leadership must advocate for structured digital literacy programs that include continuous professional development in areas such as cybersecurity, data analytics, and cloud computing (Shen et al., 2023). Without a skilled workforce, even the most advanced digital policies and infrastructures will fail to achieve their intended impact.

Digital leadership and organizational culture are central to the success of digital transformation in public administration. By fostering a culture of innovation, embracing adaptive leadership models, and addressing institutional barriers, public sector leaders can drive meaningful and sustainable digital change. Moving forward, governments must prioritize leadership development and cultural adaptation to ensure the long-term success of digital initiatives.

6.2 Theoretical Frameworks for Digital Transformation & Governance

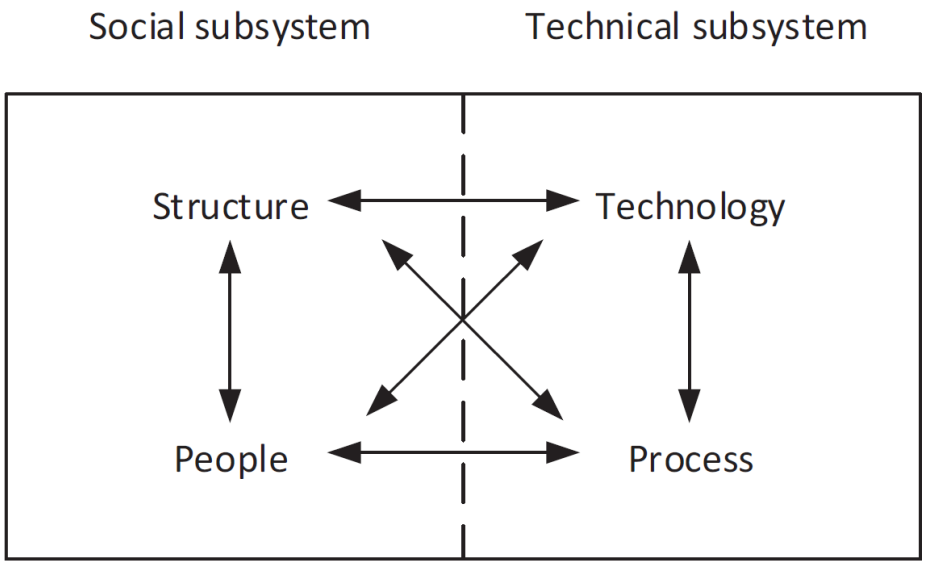
Digital transformation in public governance is not merely a technological shift but an intricate process involving social, technical, and institutional changes. Several theoretical models have been proposed to analyze and guide the integration of digital technologies in public administration. This section explores key theoretical frameworks that help understand the digitalization of governance structures, including the Diamond Framework, the Technology Enactment Framework (TEF), the Technology-Organization-Environment (TOE) Framework, the Technology Acceptance Model

(TAM), and Actor-Network Theory (ANT). These frameworks offer insights into the interplay between technology, human factors, and organizational settings.

6.2.1 Diamond Framework (Socio-Technical Model)

The Diamond Framework, proposed in the 1960s by Harold Leavitt, provides a holistic view of digital transformation by examining four interdependent organizational elements: technology, processes, structure, and people. This model suggests that successful digital transformation depends on the balanced development of these components. Initially conceptualized as a socio-technical approach, the framework acknowledges that digital transformation is not solely a technological endeavor but requires a fundamental restructuring of administrative processes and organizational culture (Fountain, 2001).

Diagram 6.2: Leavitt's diamond: a socio-technical view of IS



Source: Gong et al. (2020)

- **Technology:** Adoption of digital tools and platforms must align with broader organizational goals. Public administrations implementing digital transformation must ensure interoperability and scalability to support innovation. Governments worldwide are integrating cloud computing, AI, and blockchain technologies to enhance service delivery, as highlighted in Gong et al. (2020), where Zhejiang Provincial Government adopted big data solutions to

streamline governance operations (Gong et al., 2020). Additionally, the effectiveness of digital technology adoption depends on how well it integrates with legacy systems and existing infrastructure, as discussed in Andersson et al., 2022 on smart city projects (Andersson et al., 2022).

- **Processes:** Digitalization requires re-engineering workflows to improve efficiency and responsiveness. The restructuring of government workflows can lead to greater transparency, reduced administrative burden, and enhanced citizen engagement. The article of Gong et al. (2020) illustrates how digital governance initiatives in China followed an iterative process, gradually integrating digital platforms into public service delivery (Gong et al., 2020). Furthermore, research by Dunleavy et al. (2006) on Digital Era Governance (DEG) suggests that digital transformation is most effective when governments redesign processes to be inherently digital rather than digitizing traditional bureaucratic methods.

- **Structure:** Organizational flexibility is essential to facilitate the adoption of digital transformation initiatives. Tangi et al. emphasize that rigid bureaucratic structures often hinder innovation, requiring a shift toward agile governance models (Tangi et al., 2021). Organizational silos and hierarchical decision-making processes can slow down digital adoption, making cross-sector collaboration and horizontal governance structures essential. The implementation of agile methodologies, as seen in Weerakkody et al. (2016), allows governments to respond quickly to technological advancements and changing policy demands (Weerakkody et al., 2016).

- **People:** The workforce's digital skills and mindset play a crucial role in transformation. Employees' readiness to adopt new technologies is critical in ensuring the long-term success of digital initiatives. Pittaway & Montazemi discuss how leadership know-how and change management strategies can enhance digital governance by fostering a culture of innovation and continuous learning (Pittaway & Montazemi, 2020). Additionally, Nielsen et al. highlight the importance of digital literacy programs and upskilling initiatives to ensure public sector employees can leverage emerging technologies effectively (Nielsen et al., 2024). Research by Westerman et al. (2014) also emphasizes that

digital transformation success is often contingent upon leadership engagement and workforce adaptability.

The Diamond Framework, therefore, underscores the socio-technical dimensions of digital transformation, stressing that technological adoption must be accompanied by structural and cultural shifts. The model provides a structured approach to analyzing digital governance, ensuring that public administration leaders address both technological advancements and human factors in their transformation strategies. Governments that embrace this holistic approach are more likely to sustain long-term digital innovation and achieve greater efficiency in public service delivery.

6.2.2 Technology Enactment Framework (TEF)

The Technology Enactment Framework (TEF), introduced by Fountain (2001[2]), provides a sociotechnical perspective on how organizations adopt and integrate technology within their institutional environments. Unlike deterministic models that view technology as the primary driver of change, TEF argues that organizational structures, institutional constraints, and human agency shape how technology is enacted. This framework is particularly useful in the context of public sector digital transformation, where regulatory, political, and social factors influence the success of technology implementation.

Institutional Constraints

The TEF emphasizes that institutional structures create both opportunities and barriers for digital transformation. Regulatory requirements, bureaucratic processes, and legacy systems often slow down or limit the ability of public sector organizations to fully leverage emerging technologies. Al-Rwaidan et al. (2023) explore how policy frameworks influence the enactment of advanced technologies such as AI and

[2] Fountain, J. E. (2001). Building the virtual state: Information technology and institutional change. Brookings Institution Press.

blockchain, demonstrating that governments must navigate complex legal and ethical considerations when deploying digital innovations.

Institutional constraints also shape the degree of flexibility organizations have in adapting technology. For instance, some governments implement rigid procurement rules that make it difficult to experiment with or scale new digital solutions. In contrast, countries with adaptive regulatory environments can foster more innovative technology enactment by allowing for regulatory sandboxes and pilot projects.

Human Agency

A key contribution of the TEF is its focus on the role of individuals within organizations in shaping technology adoption. Rather than viewing technology implementation as a top-down process, TEF highlights that decision-makers, employees, and other stakeholders actively interpret, adapt, and reshape technology based on institutional goals and personal expertise.

Plesner et al. (2018) provide case studies where government officials actively shaped digital strategies rather than passively adopting external solutions. These studies illustrate that leadership engagement, cross-agency collaboration, and change management strategies significantly influence how digital tools are integrated into public administration.

Human agency also extends to street-level bureaucrats, such as government employees who interact directly with citizens. Their willingness (or resistance) to use new technologies can determine the effectiveness of e-government platforms, AI-driven decision-making tools, or open data initiatives. When public sector workers feel excluded from the technology adoption process, they may resist using new digital systems, leading to suboptimal implementation.

Technological Adaptation

The TEF recognizes that technology is not static but evolves in response to organizational needs and external pressures. Unlike models that assume technology adoption follows a predictable path, TEF emphasizes that organizations must constantly

adjust digital tools, policies, and governance models to keep pace with technological advancements and changing user needs.

Andersson et al. (2022) explore adaptive governance strategies in smart city projects, showing how municipalities refine digital infrastructure, IoT applications, and data-sharing mechanisms over time. Rather than simply deploying pre-designed solutions, successful cities create feedback loops where policymakers, technology providers, and citizens continuously assess and refine digital services.

This adaptive approach is particularly important in emerging fields such as artificial intelligence, blockchain, and cybersecurity, where the technology landscape is rapidly evolving. Governments that adopt a rigid approach to technology enactment may struggle to keep up with private sector innovation, whereas those embracing an iterative, learning-based model can enhance public service delivery and policy effectiveness.

In conclusion, the Technology Enactment Framework (TEF) provides a dynamic and iterative perspective on digital transformation, emphasizing that technology adoption is shaped by institutional constraints, human agency, and ongoing adaptation. Unlike traditional models that treat technology as an independent driver of change, TEF underscores the importance of organizational culture, leadership, and governance structures in shaping digital transformation outcomes.

6.2.3 Technology-Organization-Environment (TOE) Framework

The **Technology-Organization-Environment (TOE) Framework** is a well-established theoretical model used to examine the factors influencing technology adoption and diffusion within organizations. Developed by Tornatzky and Fleischer in 1990[3], the TOE framework provides a holistic perspective by integrating three key dimensions—**technological, organizational, and environmental**—that collectively determine how an organization adopts and implements new technologies. Unlike

[3] Tornatzky, L. G., & Fleischer, M. (1990). The processes of technological innovation. Lexington Books.

individual-level models such as the Technology Acceptance Model (TAM), which focus on user perceptions, TOE is specifically designed to analyze **organizational-level** adoption, making it highly relevant in studies on enterprise systems, cloud computing, e-commerce, and digital transformation.

Technological Context

The **technological** dimension refers to the internal and external technologies that influence an organization's decision to adopt new innovations. This includes both currently available technologies and emerging technological trends. Key factors within this context include:

1. **Relative Advantage** – The perceived benefits of adopting a technology compared to existing alternatives, such as increased efficiency, cost savings, or improved customer service.

2. **Compatibility** – The extent to which the new technology aligns with the organization's existing processes, infrastructure, and culture.

3. **Complexity** – The degree of difficulty involved in understanding, implementing, and using the new technology. Technologies perceived as too complex may face resistance.

4. **Trialability and Observability** – The ability to experiment with a technology before full implementation and the visibility of its benefits to potential adopters.

Organizations are more likely to adopt technologies that offer **a clear competitive advantage, integrate seamlessly with existing systems, and have manageable levels of complexity**. The technological landscape is constantly evolving, meaning organizations must continuously assess their readiness to integrate new digital tools.

Organizational Context

The **organizational** dimension focuses on internal characteristics that affect technology adoption, including **structure, resources, and leadership support**. The most critical factors within this domain are:

1. **Firm Size** – Larger firms typically have greater financial and human resources, making them more capable of adopting new technologies. However, bureaucratic structures in large firms may slow down decision-making.

2. **Top Management Support** – Leadership commitment plays a crucial role in facilitating adoption by securing resources, setting strategic priorities, and fostering an innovation-friendly culture.

3. **Organizational Readiness** – The availability of **financial, technical, and human resources** needed to implement and maintain a new technology.

4. **Centralization and Formalization** – Highly centralized organizations, where decision-making is concentrated at the top, may experience slower adoption due to hierarchical constraints, whereas decentralized structures often facilitate faster innovation.

A well-prepared organization with strong leadership and adequate resources is more likely to overcome adoption barriers and successfully integrate new technologies into its operations.

Environmental Context

The **environmental** dimension refers to external factors that shape an organization's technology adoption decisions, including **market conditions, regulatory policies, and competitive pressures**. Key environmental factors include:

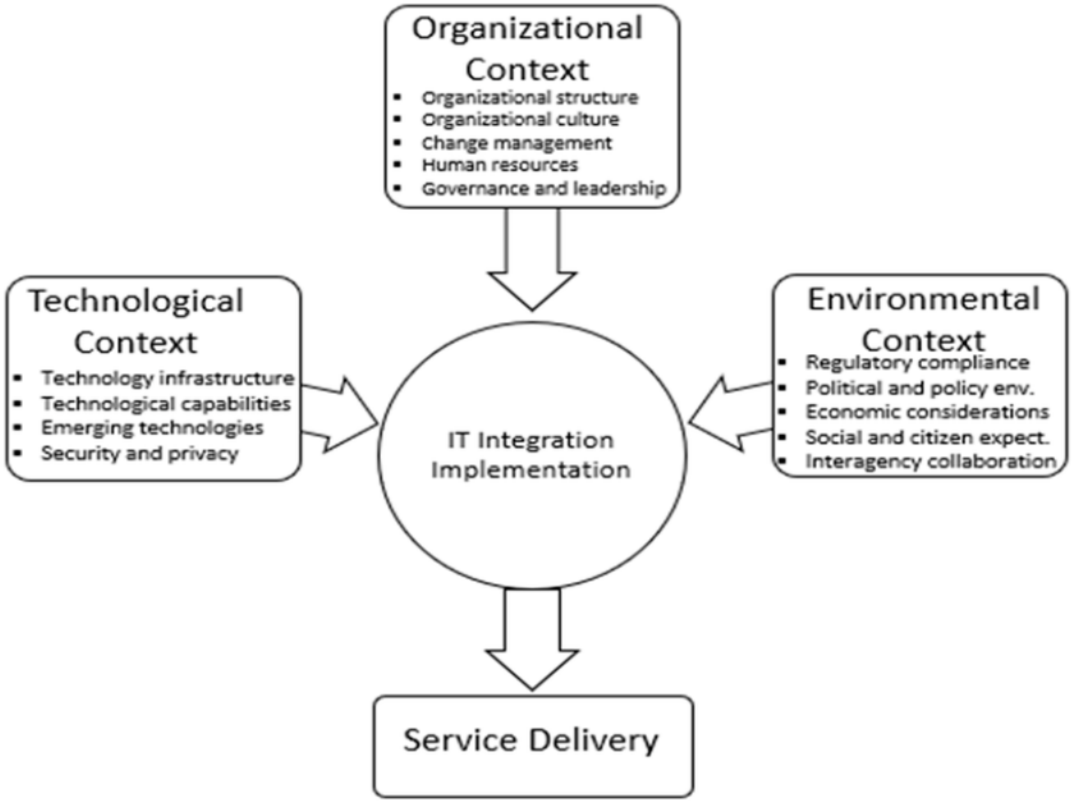
1. **Competitive Pressure** – Firms often adopt technology to remain competitive within their industry, especially if competitors are already leveraging advanced digital tools.

2. **Regulatory Environment** – Government policies, legal frameworks, and industry regulations can either encourage or hinder technology adoption. Compliance with **data protection laws, cybersecurity regulations, and industry-specific mandates** is often a determining factor.

3. **External Support** – The availability of technology vendors, consultants, and industry alliances can influence adoption. Organizations benefit from strong

technology ecosystems, including partnerships with software providers and cloud service vendors.

Diagram 6.3: The TOE framework



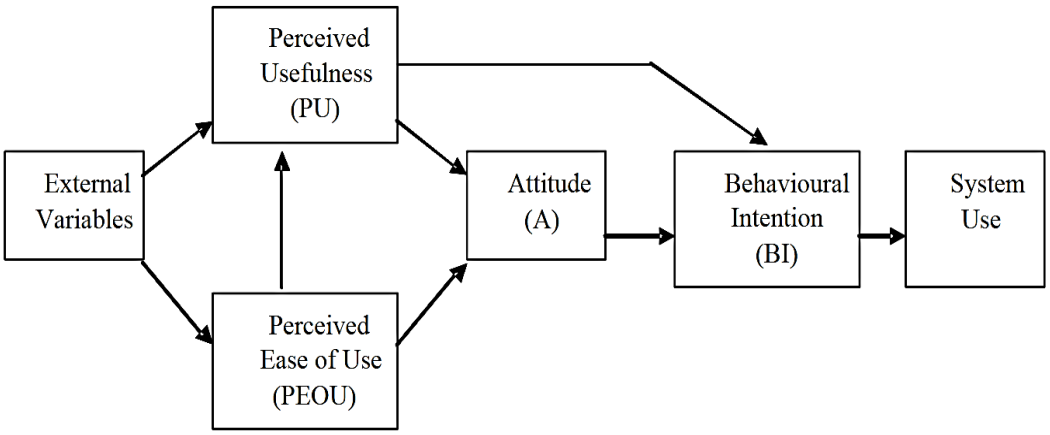
The TOE framework has been extensively applied in studies examining enterprise resource planning (ERP), e-commerce adoption, cloud computing, artificial intelligence, blockchain, and green IT initiatives. Its flexibility allows researchers to adapt the model across different industries and technological contexts. It provides a comprehensive approach to understanding technology adoption by considering the interplay between technological capabilities, organizational readiness, and environmental influences. TOE emphasizes organizational and external factors, making it particularly valuable for studying large-scale digital transformation initiatives. Future research continues to refine and extend the framework by incorporating additional factors such as cultural influences, digital maturity, and sustainability considerations, further enriching its applicability in modern technological landscapes.

6.2.4 Technology Acceptance Model (TAM)

The Technology Acceptance Model (Davis, 1989[4]) focuses on user perceptions as key determinants of technology adoption. It proposes two primary factors: perceived usefulness and perceived ease of use.

- **Perceived Usefulness:** If government employees and citizens believe that digital tools enhance efficiency, adoption rates increase. Gabryelczyk (2020) discusses how digital platforms introduced during COVID-19 were widely accepted due to their perceived necessity.
- **Perceived Ease of Use:** Simplified and intuitive digital services encourage adoption. Abdeldayem & Aldulaimi illustrate how AI-powered HR management systems were successfully integrated into Bahrain's public sector due to their user-friendly design (Abdeldayem & Aldulaimi, 2020).

Diagram 6.4: Technology Acceptance Model



Source: Davis (1989)

TAM also suggests that these two factors influence the **Attitude Toward Using Technology (ATUT)**, which refers to the user's positive or negative evaluation of the technology. This attitude is shaped by the user's experiences, beliefs, and expectations.

[4] Davis F.D., Bagozzi R.P., Warshaw, P.R. (1989), "User acceptance of computer technology: a comparison of two theoretical models", Management Science, 35, 8, 982-1003.

For example, if a person finds a new software system easy to use and beneficial for their work, they will likely develop a positive attitude toward it.

The **attitude toward technology use influences Behavioral Intention to Use (BIU)**, which refers to **the user's willingness to adopt and continue using the technology**. A positive attitude and perceived usefulness increase the likelihood that users will intend to use the system regularly.

The final dependent variable in TAM is **Actual System Use (ATU)**, which measures how often and for how long users engage with a system. BIU is considered a strong predictor of actual usage, although other factors, such as organizational policies or social influences, can also play a role in determining whether a user adopts a technology.

Over time, TAM has evolved and been expanded to include additional variables. **TAM 2** (Venkatesh & Davis, 1996[5]) introduced new factors, such as **social norms** and **perceived switching costs**, which affect adoption behavior. **TAM 3** (Venkatesh & Bala, 2008[6]) added variables related to user training and the support provided for technology adoption.

TAM has been applied in a wide range of fields, including education, e-commerce, banking, healthcare information systems, e-government, and the entertainment industry. In education, for example, TAM has been used to study the adoption of online courses (MOOCs) by students. In the corporate sector, it has helped understand how employees accept new enterprise software and information systems.

The successful adoption of a technology is often influenced by external variables, such as organizational support, training, user experience, and technological infrastructure. For example, if an organization actively promotes the use of a new information system

[5] Venkatesh, V., Davis, F. D. (1996), "A model of the antecedents of perceived ease of use:development and test", Decision Sciences, Vol. 27, No. 3, pp. 451-481.

[6] Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. Decision Sciences, 39(2), 273–315.

through training sessions and technical support, employees' perceived usefulness and intention to use the system will increase.

Overall, TAM is a robust theoretical framework for analyzing technology adoption and is widely used in academic and business research. It provides valuable insights that help organizations design technological products that better meet user needs and improve implementation strategies for new technology.

6.2.5 Actor-Network Theory (ANT)

Actor-Network Theory (ANT), developed by Latour (2005[7]), provides a sociological approach to understanding technology adoption and digital transformation. Unlike traditional models that focus solely on human decision-making or organizational structures, ANT treats both human and non-human entities as active participants in shaping technological change. This means that technologies, policies, institutions, and even algorithms are considered actors that interact within complex networks.

At the core of ANT is the idea that technological transformation is not a linear process but an evolving network of relationships where actors continuously influence and shape each other. Digital governance, in particular, is not just about adopting new technologies but about managing the interdependencies between different stakeholders, systems, and institutional frameworks.

Network Formation

One of the fundamental principles of ANT is that digital transformation relies on the formation of networks consisting of multiple actors, including policymakers, IT developers, private-sector partners, and citizens. These networks are not static structures but are constantly evolving as new actors enter, collaborate, and negotiate their roles.

[7] Latour, B. (2005). Reassembling the social: An introduction to actor-network-theory. Oxford University Press.

Karampotsis et al. (2024) examine multi-stakeholder approaches in smart city governance, illustrating how public agencies, technology firms, and community representatives must collaborate to create inclusive and sustainable urban digital infrastructures. In smart cities, governance does not simply involve implementing new technologies such as IoT, AI, and 5G; rather, success depends on the ability of diverse actors to work together, resolve conflicts, and establish shared objectives.

The formation and stability of these actor-networks determine the success or failure of digital initiatives. If key stakeholders are not aligned—such as when policymakers push for new technologies without involving citizens or technical experts—the network can become fragmented, leading to ineffective or contested implementations.

Interdependencies

ANT highlights that technologies do not function in isolation but must interact with existing administrative, legal, and policy frameworks. For digital transformation to be successful, new technologies must be aligned with existing infrastructures rather than disrupt them without a clear integration strategy.

Atobishi et al. (2024) explore how blockchain adoption in public finance required alignment with traditional accounting systems. Their study demonstrates that while blockchain offers enhanced transparency and security for financial transactions, its integration required adjustments in regulatory compliance, financial reporting standards, and legal frameworks. The adoption process was not just about implementing the technology itself but about reconfiguring relationships between blockchain applications, legacy accounting systems, financial institutions, and regulatory bodies.

This insight from ANT is crucial for understanding why many digital initiatives fail—they are often deployed without considering how they will interact with existing systems. Governments and organizations must take a holistic approach that ensures new technologies complement rather than conflict with existing administrative frameworks.

Dynamic Interactions

A key tenet of ANT is that digital transformation is a dynamic and ongoing process influenced by socio-political forces, economic pressures, and evolving technologies.

Rather than viewing technology adoption as a one-time event, ANT suggests that digital governance is continuously shaped by negotiations between different actors, who each bring their own interests, constraints, and power dynamics.

Fitsilis & Papastylianou (2024) illustrate how the interplay between regulatory bodies and IT vendors influenced e-government success in Europe. Their analysis reveals that e-government initiatives were not purely technological projects but required continuous negotiation between national governments, technology providers, and EU regulatory agencies. These interactions shaped data protection policies, interoperability standards, and procurement decisions, ultimately determining the scalability and sustainability of digital government platforms.

ANT's perspective on dynamic interactions is particularly relevant in policy-driven digital transformations, where competing interests and regulatory uncertainties can either enable or hinder innovation. It also helps explain why digital governance strategies must be adaptive, as emerging technologies—such as AI, blockchain, and quantum computing—introduce new actors into existing networks, requiring constant realignment.

As a result of the above, the Actor-Network Theory (ANT) provides a networked perspective on digital transformation, emphasizing that technologies, institutions, policies, and human actors continuously interact to shape adoption outcomes. Unlike deterministic models that assume technology adoption is a straightforward process, ANT underscores that success depends on the stability, alignment, and adaptability of socio-technical networks.

Understanding digital transformation through ANT enables more effective policy design, ensuring that technological innovations are not only technically viable but also institutionally supported and socially accepted.

6.3 Change management in bureaucratic structures

Change management within bureaucratic structures presents unique challenges due to the rigid nature of hierarchical organizations, resistance to innovation, and deeply ingrained procedural norms. Bureaucratic institutions, particularly in the public sector, often struggle with digital transformation and modernization efforts, requiring strategic interventions to facilitate adaptation while maintaining stability. Without effective strategies, change initiatives may face opposition, leading to inefficiencies and failed implementations. Therefore, understanding the factors influencing change and the methods to overcome resistance is crucial for ensuring successful transitions.

6.3.1 Characteristics of Bureaucratic Structures

Bureaucratic organizations are defined by several core characteristics that influence their response to change:

- **Hierarchy and Chain of Command**: Decision-making authority is centralized, meaning that major changes require approval from multiple levels of leadership. This slows down adaptation to new policies and technologies, making it difficult for bureaucratic organizations to respond quickly to emerging challenges (Gong et al., 2020; Andersson et al., 2022). As a result, even beneficial changes can be delayed for years due to excessive administrative reviews.

- **Formalized Rules and Procedures**: Standardized processes ensure consistency and fairness in decision-making. However, they often hinder innovation because employees must follow strict regulations, limiting their ability to experiment with new approaches (Pittaway & Montazemi, 2020; Nielsen et al., 2024). This rigid structure makes it difficult to implement flexible solutions that adapt to evolving circumstances.

- **Specialization and Division of Labor**: Employees focus on specific functions within an organization, increasing efficiency in routine tasks. However, when cross-functional collaboration is needed to drive change, silos can form, leading to poor communication and lack of cooperation between departments (Tangi et

al., 2021; Fitsilis & Papastylianou, 2024). This division can create resistance when changes require employees to step outside their narrowly defined roles.

- **Impersonal Relationships**: Bureaucratic structures emphasize professionalism and formal communication, ensuring that decisions are made based on rules rather than personal influence. While this maintains fairness, it also slows down change adoption, as employees may feel disengaged from the decision-making process and less motivated to embrace new initiatives (Al-Rwaidan et al., 2023; Plesner et al., 2018). This detachment can lead to low morale and reluctance to participate in change efforts.

6.3.2 Barriers to Change in Bureaucratic Organizations

Bureaucratic resistance to change is driven by various structural, cultural, and technological factors.

Structural Barriers

- **Rigid Hierarchies**: The centralized nature of bureaucratic organizations means that decision-making is controlled by top management, making it difficult to implement bottom-up change initiatives. Employees at lower levels often feel powerless to influence decisions, reducing their motivation to support new policies (Weerakkody et al., 2016). This hierarchical structure discourages innovation and makes adaptation a slow, cumbersome process.

- **Siloed Departments**: Different units within a bureaucratic organization often work independently, focusing on their specific functions rather than collaborating with other teams. This lack of coordination can lead to inconsistencies in policy implementation, creating confusion and inefficiencies (Atobishi et al., 2024). Without a culture of cross-departmental communication, change efforts can become fragmented and ineffective.

- **Lengthy Approval Processes**: Bureaucratic organizations rely on formal approvals for almost every decision, requiring extensive paperwork and multiple levels of review. While this ensures accountability, it also delays the

implementation of necessary changes (Brunetti et al., 2020; Alvarenga et al., 2020). When approval processes take months or even years, organizations risk falling behind in a rapidly evolving environment.

Cultural Barriers

- **Risk Aversion**: Bureaucratic institutions prioritize stability and predictability over innovation. Employees and leaders may resist change due to fears that new processes or technologies could introduce errors, inefficiencies, or unintended consequences (Abdeldayem & Aldulaimi, 2020; Ahn & Chen., 2022). This fear of failure discourages experimentation, leading to stagnation in government agencies and other bureaucratic entities.

- **Employee Resistance**: Many employees in bureaucratic settings have spent years, or even decades, following the same procedures. When new initiatives are introduced, they may worry about job displacement, increased workloads, or the loss of expertise they have built over time (Karampotsis et al., 2024). Without clear communication and incentives, employees are unlikely to support significant changes.

- **Lack of Change Leadership**: Change initiatives require strong leadership to drive them forward. In bureaucratic organizations, leaders may be hesitant to challenge the status quo due to political pressures or fear of backlash (Gabryelczyk, 2020). When leadership fails to champion change, employees are less likely to take transformation efforts seriously.

Technological Barriers

- **Legacy Systems**: Many bureaucratic organizations rely on outdated IT infrastructure that is incompatible with modern digital solutions. Upgrading these systems requires significant investments, time, and effort, making digital transformation a slow and complex process (Nielsen et al., 2024). Legacy systems can also limit interoperability between different departments, further complicating change efforts.

- **Cybersecurity Concerns**: As bureaucratic organizations move toward digitalization, they must also consider data protection measures. The fear of cyber threats and data breaches can make leaders hesitant to adopt new technologies, even when they offer efficiency gains (Plesner et al., 2018). Without proper security protocols, digital transformation initiatives may face resistance from risk-averse decision-makers.

- **Digital Literacy Gaps**: Employees in bureaucratic organizations may lack the necessary digital skills to adapt to new technologies. Training programs are often underfunded or deprioritized, leaving workers unprepared to engage with modern tools and platforms (Fitsilis & Papastylianou, 2024). This gap in knowledge creates further barriers to successful change adoption.

6.3.3 Strategies for Effective Change Management

1. Leadership-Driven Change

Strong leadership is essential to navigate bureaucratic resistance and drive change initiatives successfully. Effective leaders:

- Clearly communicate the vision and objectives of change, ensuring that all employees understand why transformation is necessary and what benefits it will bring (Tangi et al., 2021; Al-Rwaidan et al., 2023). Without a compelling vision, employees may see change as unnecessary or disruptive.

- Foster an organizational culture that values adaptability and innovation, encouraging employees to experiment with new approaches without fear of punishment (Brunetti et al., 2020; Andersson et al., 2022). Leaders who reward creativity help cultivate an environment where change is embraced rather than resisted.

- Engage stakeholders at all levels, involving employees, department heads, and external partners in the change process to build consensus and commitment (Atobishi et al., 2024; Gabryelczyk, 2020). Collaboration ensures that

transformation efforts consider diverse perspectives and meet the needs of all parties involved.

2. Incremental Change Implementation

Bureaucratic organizations benefit from gradual change rather than abrupt transformations. This involves:

- **Pilot Programs**: Testing changes on a small scale before widespread adoption helps identify potential issues and allows for refinements before full implementation (Alvarenga et al., 2020; Karampotsis et al., 2024). A successful pilot can also demonstrate the benefits of change, making it easier to gain employee buy-in.

- **Phased Rollouts**: Introducing new processes in stages minimizes disruptions to daily operations and allows employees to adapt gradually (Ahn & Chen., 2022). This approach reduces resistance by giving staff time to adjust and build confidence in the new system.

- **Feedback Mechanisms**: Continuously assessing the impact of changes and making adjustments ensures that transformation efforts remain effective (Plesner et al., 2018; Nielsen et al., 2024). Employee feedback should be actively solicited and incorporated into decision-making processes to improve outcomes.

By implementing these strategies, bureaucratic organizations can overcome resistance and successfully manage change, ensuring that they remain relevant and efficient in an evolving landscape.

6.4 Global Experience

6.4.1 Case study of Zhejiang Provencal Government (ZPG) in China

The article "Towards a Comprehensive Understanding of Digital Transformation in Government: Analysis of Flexibility and Enterprise Architecture" by Gong et al. (2020) explores how digital transformation (DT) unfolds within hierarchical bureaucracies and the role of flexibility in enabling this transformation. The authors argue that despite the recognized importance of digital transformation for improving government efficiency and service delivery, empirical research on the subject is still limited. They propose a conceptual model combining the diamond framework, technology enactment framework, and enterprise architecture scope to analyze government adaptation processes over a five-year period.

The introduction sets the stage by emphasizing that in the modern digital economy, citizens expect highly available and efficient public services. Governments worldwide have developed digital strategies, such as the EU eGovernment Action Plan and the US Digital Government Strategy, yet many transformation efforts fail due to a lack of understanding of how technology, institutional structures, and bureaucratic processes interact. Digital transformation in government is complex, involving radical and incremental changes that affect infrastructure, services, business processes, and organizational structures. The study argues that flexibility is essential for governments to adapt to these changes effectively.

The authors present digital transformation as a continuous process involving significant technological and organizational shifts. They define it as an effort to improve government entities through the integration of computing, communication, and connectivity technologies. Digital transformation is distinguished from past IT-enabled changes by the adoption of technologies such as artificial intelligence, cloud computing, big data analytics, and the Internet of Things. However, technological adoption alone is insufficient; it must be accompanied by organizational changes to be truly transformative. Governments often face barriers due to rigid bureaucratic structures, and this rigidity hampers their ability to implement flexible digital solutions.

Flexibility is a key theme in the study, referring to the ability of organizations to adapt efficiently to a changing environment. The study categorizes different types of

flexibility, including infrastructure flexibility, process flexibility, organizational flexibility, and network flexibility. The authors argue that flexibility is crucial for digital transformation but has been underexplored in e-government literature. Enterprise architecture (EA) is introduced as a tool for understanding flexibility because it provides a comprehensive overview of how business and IT systems interact. EA helps map the relationships between organizational structures, processes, and technological infrastructure, offering insights into how governments can create flexibility to enable transformation.

The research is based on a case study of a provincial government in China, which has been a leader in digital government transformation. The case study examines how this government created flexibility over five years through a series of digital initiatives. The research method includes analyzing government documents, conducting interviews with officials and IT experts, and reviewing enterprise architecture records to track changes in organizational structures, processes, and technology.

The case study is divided into three waves of digital transformation. The first wave, from 2014 to 2016, focused on cloud computing adoption to support online service delivery. The government launched a cloud-based administrative service platform, streamlining processes and reducing operational costs. The second wave, from 2016 to 2018, involved the adoption of big data technologies to enhance data sharing between departments. This enabled the creation of a "one-stop shop" service model, allowing citizens to access multiple government services through a single platform. The third wave, from 2018 to mid-2019, saw the expansion of one-stop shop services and the restructuring of government agencies to support digital governance. A new department was created to oversee service integration, and thousands of government staff positions were reduced as digital processes replaced manual workflows.

The study highlights that digital transformation progresses in waves, with flexibility increasing over time. In the early stages, technology-enabled flexibility, such as cloud computing and digital platforms, played a crucial role. In later stages, policy-enabled flexibility, including institutional reforms and new governance structures, became more important. The findings indicate that successful digital transformation requires both technological and organizational flexibility. Governments must be willing to restructure

their bureaucratic processes, create cross-departmental collaboration mechanisms, and invest in digital skills training for public servants.

The authors develop an adaptation matrix to illustrate how different types of flexibility contribute to digital transformation at various bureaucratic levels. Infrastructure flexibility, such as cloud computing, supports technical adaptation, while process flexibility enables streamlined service delivery. Network flexibility, achieved through policy changes and organizational restructuring, facilitates cross-agency collaboration. The study also finds that digital transformation in government is not purely a technological issue but involves deep institutional and cultural changes.

The article concludes by emphasizing the need for a cross-level approach to digital transformation, considering changes at different bureaucratic levels. While most existing research focuses on individual government agencies, the study argues that transformation must be analyzed across multiple levels of administration to fully understand its impact. The authors recommend that governments adopt enterprise architecture frameworks to systematically manage digital transformation, ensuring that flexibility is embedded in both technology infrastructure and institutional structures. They also suggest that future research should explore digital transformation in other countries to compare strategies and identify best practices.

Overall, the study contributes to the growing body of knowledge on digital transformation in government by providing empirical insights into how flexibility is created and how it evolves over time. The research underscores the importance of both technology and policy in enabling successful transformation, offering valuable lessons for policymakers and government leaders seeking to modernize public administration.

6.4.2 HR Management in Jordanian public sector

Al-Rwaidan et al. (2023) investigate how cloud computing technologies influence the digitalization of human resource management in the Jordanian public sector. The study aims to explore how different cloud-based service models—Infrastructure as a Service (IaaS), Performance as a Service (PaaS), and Software as a Service (SaaS)—affect HR digital transformation.

Cloud computing is increasingly becoming a dominant force in business operations due to its scalability, cost-effectiveness, and ability to streamline complex processes. In HR management, cloud solutions facilitate the automation of administrative tasks, employee performance tracking, and recruitment processes. The research highlights that cloud computing enables HR departments to store and access vast amounts of data securely while reducing operational costs. However, it also acknowledges potential drawbacks, such as security risks, data accessibility issues, and reduced real-time monitoring of employee performance.

The study employs a quantitative methodology, using survey data collected from 346 HR professionals working in Jordan's public sector. Structural Equation Modeling (SEM) was used to analyze the impact of different cloud service models on HR digital transformation. The results indicate that all three service models—Infrastructure as a Service, Performance as a Service, and Software as a Service—have a significant and positive effect on the digital transformation of HR practices. Infrastructure as a Service contributes by providing scalable and cost-effective IT resources, Performance as a Service enhances employee productivity tracking, and Software as a Service facilitates HR process automation.

Despite these advantages, the study identifies several challenges in adopting cloud-based HR solutions. Security concerns are prominent, as reliance on third-party cloud providers may expose sensitive employee data to cyber threats. The study also points out that cloud-based HR systems may lack real-time monitoring capabilities, as they often depend on employees self-reporting their progress rather than automated tracking.

The research is grounded in theoretical frameworks, particularly the Technology-Organization-Environment (TOE) framework and Actor-Network Theory (ANT). The TOE framework suggests that the adoption of cloud computing in HR is influenced by technological, organizational, and environmental factors. The ANT framework, on the other hand, emphasizes the role of various actors—both human and technological—in shaping cloud adoption outcomes. These theories help explain why some organizations embrace cloud-based HR solutions more readily than others.

The study's findings have important implications for HR managers and policymakers. Given the demonstrated benefits of cloud-based HR solutions, organizations in Jordan's

public sector are encouraged to invest in cloud technologies to enhance their HR functions. However, they should also implement robust security measures to mitigate potential risks. Additionally, organizations must address issues related to data accessibility and real-time performance tracking to fully leverage the advantages of cloud computing.

The study acknowledges certain limitations. It focuses solely on Jordan's public sector, meaning the findings may not be generalizable to private-sector organizations or other countries. Moreover, it considers only three cloud service models, leaving room for future research to explore other aspects of cloud computing, such as hybrid cloud solutions or artificial intelligence-driven HR technologies.

Overall, the study concludes that cloud-based solutions play a crucial role in the digital transformation of HR practices, offering significant benefits while also presenting some challenges that organizations must address. By carefully managing the risks and optimizing cloud-based tools, HR departments can achieve greater efficiency, cost savings, and improved employee management.

6.4.3 The upcoming of Digital Government Units in public sectors

The article "Digital Government Units: What Are They, and What Do They Mean for Digital Era Public Management Renewal?" by Amanda Clarke (2020) explores the emergence, function, and implications of Digital Government Units (DGUs) as a response to long-standing inefficiencies in government IT management. Since 2011, DGUs have become a preferred solution for governments seeking to modernize digital services, improve efficiency, and align public sector digital capabilities with evolving technological expectations. Clarke's research highlights the core attributes of DGUs, their governance structures, their successes and failures, and the challenges they pose to traditional public management frameworks.

The article begins by establishing the historical context that led to the creation of DGUs. Governments have struggled with costly, underperforming digital services for decades, often characterized by long-term outsourcing contracts, fragmented IT governance, and an inability to keep up with private-sector advancements. Many early "e-government"

initiatives were hampered by the principles of New Public Management (NPM), which emphasized decentralization and outsourcing, leading to inefficiencies and inflated costs. Governments often lacked the in-house expertise to evaluate and manage IT projects effectively, resulting in dependence on a small pool of large private-sector vendors. Additionally, government IT procurement tended to be siloed, meaning departments often developed redundant systems rather than implementing shared, cost-effective solutions.

Against this backdrop, the UK government pioneered the first major DGU, the Government Digital Service (GDS), in 2011. GDS aimed to centralize and modernize digital governance, adopting agile development practices, user-centered design, data-driven decision-making, and open-source solutions. The success of GDS, including its widely praised gov.uk platform, inspired other governments to establish their own DGUs, including the United States Digital Service (USDS) and 18F (both in the U.S.), the Canadian Digital Service (CDS), the Ontario Digital Service (ODS), and Australia's Digital Transformation Agency (DTA). These units share a common orthodoxy, advocating for government-wide digital platforms, modular procurement strategies, and an ethos of rapid delivery.

Despite their shared goals, DGUs vary in governance structures, powers, and resources. Some, like GDS and DTA, operate with strong centralized authority, controlling IT spending and setting mandatory digital standards for government departments. Others, like USDS and CDS, function more as advisory or support units, assisting agencies without directly controlling digital policies or budgets. Clarke identifies these two models as the "strong top-down" approach versus the "diffuse leadership" model, each with its own advantages and drawbacks. The centralized approach enables greater enforcement of digital transformation but often faces resistance from government departments reluctant to cede control. Conversely, the advisory model fosters collaboration but may struggle to drive systemic change.

Clarke raises key research questions about the effectiveness of DGUs. While they have shown early successes, particularly in talent recruitment and cost-saving measures, their long-term impact remains uncertain. Some critics argue that DGUs have focused on "low-hanging fruit"—relatively simple service improvements—rather than tackling deep-seated structural inefficiencies in government IT. Additionally, there is concern

that DGUs replicate some of the issues they were created to solve, such as a lack of coordination with traditional bureaucratic structures and accountability mechanisms.

One of the most pressing challenges for DGUs is sustainability. Clarke highlights external threats, including lobbying from private-sector vendors who stand to lose lucrative government contracts and political shifts that could defund or dismantle DGUs. The example of the Trump administration's approach to USDS illustrates how political transitions can impact DGUs' survival. Furthermore, DGUs rely on attracting top-tier digital talent, often from the private sector, which may be difficult to sustain over time, particularly if political climates or job market conditions change.

The article also discusses the accountability dilemmas posed by DGUs. As these units gain influence, they may blur traditional lines of responsibility between government ministers, agencies, and IT professionals. Ministers who oversee specific policy areas may struggle to retain control over digital services that are increasingly managed by DGUs. This raises questions about democratic accountability, particularly when DGUs prioritize agility and innovation over bureaucratic process compliance. Clarke warns that while reducing red tape is desirable, unchecked digital reforms could introduce risks related to data security, citizen privacy, and government transparency.

Ultimately, Clarke positions DGUs as a critical but still-evolving aspect of digital-era public management. Their rapid proliferation suggests strong demand for centralized digital expertise, but their varied implementation and mixed reception indicate that there is no one-size-fits-all model. The article calls for further research to assess whether DGUs represent a lasting solution to government IT inefficiencies or whether they will face the same pitfalls as previous reform efforts. Clarke argues that governments should remain flexible, learning from both the successes and setbacks of early DGUs to refine their approach to digital transformation.

In conclusion, "Digital Government Units: What Are They, and What Do They Mean for Digital Era Public Management Renewal?" provides a foundational analysis of DGUs as a contemporary public management innovation. It identifies their core attributes, governance models, achievements, and challenges, while urging scholars and policymakers to critically assess their long-term viability. As governments continue to

grapple with digital transformation, the role of DGUs will remain a key subject of study and debate.

Table 6.2: Governance structures, resources and powers in DGUs.

DGU	Location in Government	Budget	Staff	IT Spending Control?	Hiring Control?
GDS (UK)	Cabinet Office	$140M	653	✅	✅
USDS (USA)	White House (OMB)	$14M	200	❌	❌
18F (USA)	General Services Admin.	Cost-Recovery Model	200	❌	❌
DTA (Australia)	Prime Minister's Dept.	$18M	100	✅	❌
CDS (Canada)	Treasury Board	N/A	19	❌	❌
ODS (Ontario, Canada)	Cabinet Office	$12M	84	❌	❌

Source: Clarke (2020)

6.4.4 Technology Acceptance in government institutions in Indonesia

The study "Technology Acceptance Model in Government Context: A Systematic Review on the Implementation of IT Governance in a Government Institution" by Amali et al. (2022) explores the factors that influence the adoption and use of information technology and information systems (IT/IS) in government institutions in Indonesia. With rapid advancements in digital technology, governments worldwide are

increasingly integrating IT/IS into public administration to improve efficiency, service delivery, and transparency. However, the success of IT/IS implementation depends on the acceptance and behavior of users. This study applies the Technology Acceptance Model (TAM) to examine how various factors, including perceived usefulness, perceived ease of use, and attitudes, impact behavioral intention and actual usage of IT/IS in government institutions.

The research employs a mixed-methods approach, using both quantitative and qualitative methodologies. Data collection involved 125 respondents, including school operators, office administrators, and education office staff from the Northern Gorontalo Regency in Indonesia. Questionnaires were distributed to gather insights into user perceptions, while interviews and observations provided additional qualitative data. Statistical analysis was conducted using Smart Partial Least Squares (SmartPLS) version 3.0 and IBM SPSS 19 to test hypotheses and analyze the relationships between variables. The study aimed to validate the TAM framework in a government setting and provide insights into the optimization of IT/IS usage in public institutions.

The findings indicate that perceived ease of use (PEOU) significantly affects perceived usefulness (PU), meaning that users who find IT/IS easy to operate are more likely to see it as beneficial for their work. This confirms previous research within the TAM framework, where usability plays a critical role in shaping user perceptions. However, the study reveals that perceived usefulness does not significantly influence users' attitudes toward using technology (ATUT). This contrasts with earlier studies that suggested a direct relationship between usefulness and attitude. The reason for this discrepancy is that IT/IS usage in government institutions is often mandatory, meaning that employees must use the system regardless of their personal perceptions of its usefulness.

Another significant finding is that perceived ease of use positively affects users' attitudes toward technology adoption. When IT/IS is easy to navigate and understand, users are more likely to develop a positive attitude toward its implementation. This supports the argument that enhancing system usability through intuitive interfaces and simplified functionalities can encourage widespread adoption. Additionally, the study finds that attitude toward technology plays a crucial role in influencing behavioral intention to use (BITU). When users develop a favorable attitude towards IT/IS, they

are more likely to intend to use the system frequently. This, in turn, strongly correlates with actual technology use (ATU), indicating that behavioral intention is a major predictor of real-world adoption.

One of the key contributions of this research is its emphasis on IT governance in public institutions. IT governance ensures that IT/IS implementations align with organizational goals while promoting transparency, compliance, and risk management. Poor IT governance often results in failed projects, budget inefficiencies, and ineffective technology adoption. Based on the study's findings, several recommendations are provided for improving IT governance in government settings. First, training and awareness programs should be implemented to ensure that employees understand the benefits and functionalities of IT/IS. This can enhance both perceived ease of use and perceived usefulness, leading to higher adoption rates. Second, government agencies should focus on improving system usability by incorporating user-friendly designs and interfaces that minimize complexity. Third, decision-makers should leverage TAM-based insights to develop IT policies that encourage positive attitudes and behavioral intentions among employees. Fourth, regular performance evaluations should be conducted to assess IT/IS effectiveness and identify areas for improvement. Lastly, strengthening IT governance frameworks can ensure that technology initiatives align with broader organizational objectives while fostering transparency and accountability.

The study concludes that the successful implementation of IT/IS in government institutions requires careful consideration of user behavior and attitudes. While perceived ease of use and attitude significantly influence IT/IS adoption, perceived usefulness does not have a direct impact on attitudes in mandatory-use environments. These findings challenge traditional assumptions in the TAM model and highlight the need for further research into contextual factors affecting technology acceptance in public institutions. Future studies could explore additional variables, such as external organizational influences, infrastructure readiness, and motivational factors, to develop a more comprehensive understanding of IT/IS adoption in government settings. By advancing research in this field, policymakers and IT administrators can make informed decisions that optimize technology implementation, enhance service delivery, and improve overall governance efficiency.

CHAPTER 7. CITIZEN-CENTRIC SERVICES & ENGAGEMENT

Transparency is not just about access to information but also about participatory governance. Digital platforms have enabled new forms of citizen engagement, such as:

- **Participatory Budgeting Platforms:** Some cities allow citizens to vote on budget allocations through online platforms (van Dijck J., 2020).
- **Crowdsourced Policy Development:** Open innovation platforms enable the public to contribute ideas for legislative reforms (Irimie, 2015).
- **Social Media Governance:** Public officials increasingly use social media to communicate policies, though this raises concerns about misinformation and selective engagement (Kuhlmann & Heuberger, 2023).

However, digital engagement initiatives face barriers such as digital divides, political resistance, and concerns over online manipulation. Governments must implement safeguards to ensure inclusivity and prevent the marginalization of underrepresented groups. For instance, in Estonia, the government has successfully integrated digital tools for participatory governance, ensuring broad accessibility and responsiveness in decision-making (Hujran et al., 2023). However, in less digitally mature nations, citizen engagement platforms often struggle with low adoption rates and trust issues, limiting their effectiveness (Castro & Lopes, 2022).

7.1 Digital platforms and citizen engagement

Digital platforms have become a cornerstone of modern public administration, enabling governments to interact with citizens in real time, provide public services, and foster transparency. The rise of digital governance has altered the traditional citizen-government relationship, moving from a bureaucratic model to a more participatory, technology-driven system. This section explores the role of digital platforms in

enhancing citizen engagement, drawing on various academic studies, case studies, and empirical research.

Digital platforms enable governments to provide services, collect feedback, and promote transparency through online tools such as e-governance portals, participatory budgeting systems, and open data initiatives. According to Criado & Gil-Garcia (2019), digital platforms serve as enablers of smart governance, leveraging artificial intelligence, blockchain, and big data analytics to foster public participation.

7.1.1 Citizen Participation through Digital Platforms

Citizen participation is one of the fundamental pillars of democratic governance, and digital platforms have amplified opportunities for engagement. Governments employ digital platforms to facilitate direct citizen involvement in decision-making processes.

- **Participatory Budgeting:** Platforms such as Decidim in Spain and NYC's participatory budgeting portal allow residents to allocate public funds democratically. By providing a structured digital framework, these platforms ensure that citizens have a direct say in budgetary priorities, fostering a sense of ownership over public resources. Research has shown that participatory budgeting leads to increased citizen satisfaction with local governance and higher transparency in fund allocation.

- **Consultation Platforms:** Online platforms like eDemocracy and CitizenLab enable governments to consult citizens on policy matters, gathering input to shape legislative decisions. These platforms employ various digital tools, such as surveys, discussion forums, and real-time polling, to facilitate meaningful engagement. Through these mechanisms, governments can gauge public sentiment on policy proposals, allowing for evidence-based policymaking that aligns with citizens' needs.

- **Petition Platforms:** Websites such as Change.org and official government portals provide citizens with a space to advocate for legislative or administrative changes. When citizens submit petitions, they are often accompanied by digital

signatures and social media campaigns that raise awareness and pressure decision-makers. Many governments have integrated these platforms into official decision-making channels, ensuring that petitions with significant public backing receive formal consideration.

7.1.2 Service Delivery Enhancement

Governments utilize digital portals to streamline administrative services, reducing bureaucratic inefficiencies and enhancing user experiences (Kim et al., 2022). Digital service platforms allow citizens to:

- **Apply for official documents such as passports and driver's licenses online.** These platforms reduce the need for physical visits to government offices, minimizing long wait times and administrative burdens. Digital applications often include automated verification systems that speed up the processing of requests, ensuring quicker turnaround times for essential documents.

- **Schedule appointments with government agencies without visiting physical offices.** Appointment booking systems on government websites provide citizens with flexible scheduling options, reducing congestion at service centers. Some platforms also incorporate AI-powered chatbots that guide users through the booking process and provide answers to frequently asked questions.

- **Access tax and financial services through digital portals like Estonia's e-Residency program.** Estonia's pioneering e-Government initiative allows residents and international entrepreneurs to manage business operations remotely. The system integrates secure authentication mechanisms, ensuring that financial transactions and tax filings are conducted in a fraud-resistant digital environment.

Moreover, governments worldwide are implementing open data and digital platforms that provide access to government-held data enhance public trust by promoting transparency, fostering accountability and reducing corruption risks (Hujran et al., 2023).

7.1.3 Case Studies of Digital Platforms and Citizen Engagement

Senyo et al. (2021) examine Ghana's digital platform transformation through the implementation of a paperless port system. This initiative aimed to improve efficiency, reduce corruption, and enhance trade facilitation through a centralized digital system.

- **Methodology:** The study utilized the Technology Affordance Theory to analyze how stakeholders interact with digital platforms. Researchers conducted qualitative interviews with port officials, traders, and customs agents to assess the effectiveness of the system.

- **Findings:** The implementation led to reduced processing times, enhanced revenue collection, and minimized human intervention, thereby reducing opportunities for corrupt practices. The digital platform enabled electronic customs clearance, eliminating bureaucratic inefficiencies that had previously resulted in delays and bribery.

- **Implications:** This case underscores how digital platforms, when properly implemented, can enhance transparency, reduce inefficiencies, and increase citizen trust in government services. The success of the initiative demonstrates the potential of digital solutions in modernizing trade facilitation across developing economies.

Hujran et al. (2023) investigate the adoption of smart government initiatives in the UAE, utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT).

- **Methodology:** A survey-based empirical study involving 414 participants was conducted to assess determinants of digital platform adoption. Respondents included government employees, IT specialists, and citizens utilizing smart services.

- **Findings:** Performance expectancy had the highest impact on platform usage, highlighting the importance of efficiency in digital governance. The study found that ease of use and trust in government systems were also critical factors influencing adoption rates.

- **Implications:** Citizen engagement is strongly correlated with the perceived usefulness and convenience of digital services, reinforcing the need for user-centric platform designs. Governments must invest in user experience enhancements and cybersecurity measures to maintain high engagement levels.

Profiroiu et al. (2024) discuss how various EU member states leveraged digital platforms in their national recovery and resilience plans, particularly in response to the COVID-19 crisis.

- **Italy allocated €13.87 billion to digital public services**, prioritizing healthcare and IT interoperability. The funds were directed towards creating an integrated health records system, enabling better data-sharing between hospitals and public health agencies.

- **Germany invested €7.14 billion**, focusing on e-services and digital administration. A significant portion of this investment went into modernizing online identity verification mechanisms, reducing fraud in government transactions.

- **Spain directed 89% of its digital budget to IT solutions**, emphasizing service digitalization at both national and regional levels. Spanish municipalities rolled out smart city solutions, such as AI-powered traffic monitoring and automated waste management systems, to enhance urban governance.

These investments demonstrate the increasing reliance on digital platforms to ensure governmental efficiency and service continuity in times of crisis.

Digital platforms have revolutionized citizen engagement by promoting transparency, efficiency, and participation. Case studies from Ghana, the UAE, and the EU illustrate the transformative impact of digital governance. However, challenges such as digital inclusion, privacy concerns, and adoption barriers must be addressed to fully realize the potential of digital citizen engagement. Future advancements in AI, blockchain, and smart connectivity hold immense promise in reshaping the landscape of digital governance.

7.2 Smart cities and IoT applications for citizen engagement

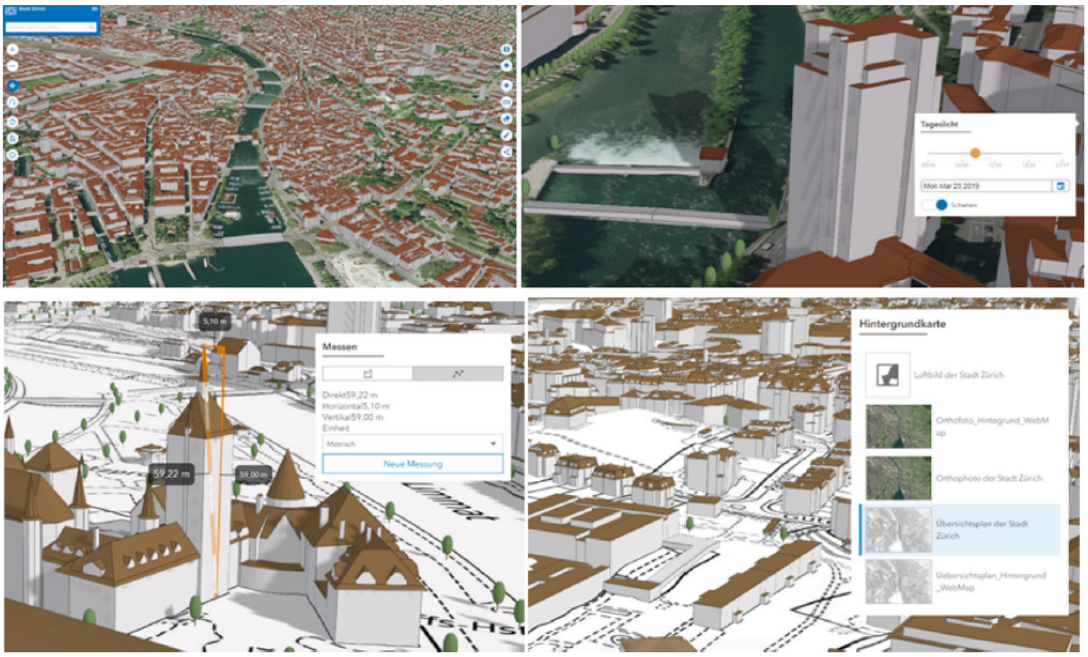
Smart cities are urban environments that leverage Internet of Things (IoT) technologies, data analytics, and digital platforms to enhance efficiency, sustainability, and quality of life. The implementation of IoT in smart cities has facilitated significant advancements in infrastructure, environmental monitoring, governance, transportation, and public safety. This section explores various IoT applications in smart cities, providing detailed case studies based on empirical research.

7.2.1 Digital Twin Technology for Urban Planning

One of the most transformative IoT applications in smart cities is the **Digital Twin** concept, which provides a real-time, data-driven virtual model of a city. This technology enables predictive analysis, improved decision-making, and resource optimization.

Schrotter & Hürzeler (2020) examine the implementation of a **Digital Twin** in Zurich for urban planning. The study focuses on how a virtual replica of the city integrates real-time data for infrastructure management. The case study details the **evolution of Zurich's 3D City Model**, initially developed in the 1990s, which later evolved into a **real-time interactive Digital Twin**. The methodology includes **LIDAR-based data collection, GIS integration, and sensor networks** providing live updates on traffic, weather, and energy consumption. The study highlights **key applications such as simulating noise pollution, optimizing traffic flow, and assessing environmental impact**. The outcomes demonstrate improved urban planning efficiency and greater public engagement, as citizens can visualize proposed projects before implementation (Schrotter & Hürzeler, 2020).

Diagram 7.1: Virtual Zurich. Preview of the digital twin



Source: Schrotter & Hürzeler (2020)

7.2.2 Smart Transportation and Traffic Management

IoT-based traffic management systems use real-time data to optimize vehicle movement, reduce congestion, and enhance public transport efficiency.

Zekić-Sušac et al. investigate the impact of **IoT-enabled intelligent traffic management** in a major European city. The case study focuses on **Barcelona's Smart Traffic System**, where IoT sensors, GPS tracking, and AI algorithms are deployed across the city's road network. The research methodology involves **big data analysis of traffic patterns, real-time monitoring, and predictive modeling**. The study finds that **adaptive traffic light systems and AI-based route optimization have led to a 30% reduction in traffic congestion and a 15% decrease in commute times**. Additionally, IoT-integrated public transport monitoring has increased ridership efficiency, reducing operational costs by 20% (Zekić-Sušac et al., 2021).

7.2.3 IoT for Environmental Monitoring

Smart cities utilize IoT-based environmental monitoring to track pollution levels, water quality, and air composition in real time.

Chatfield & Reddick (2019) explore the role of IoT in environmental sustainability, focusing on **air quality monitoring in Singapore**. The research involves deploying **IoT-based sensors across urban areas to measure CO2, NO2, and PM2.5 levels**. The study follows a **quantitative data collection approach**, integrating real-time sensor readings with **historical pollution data**. Findings indicate that IoT-based monitoring has led to **a 40% improvement in pollution detection accuracy**, allowing for better governmental response strategies. The study also highlights how **citizen engagement through mobile applications enhances environmental awareness**, as real-time pollution data is made accessible to the public (Chatfield & Reddick, 2019).

Diagram 7.2: A theoretical framework for smart government through IoT

Source: Chatfield & Reddick (2019)

7.2.4 Smart Waste Management

IoT-enabled waste management improves garbage collection efficiency, reduces costs, and minimizes environmental impact.

Gracias et al. examine **IoT-driven waste management** in Amsterdam. The research analyzes the implementation of **smart bins equipped with fill-level sensors**, which optimize waste collection schedules. The methodology consists of **sensor data analysis, logistic route optimization, and cost-benefit evaluation**. Results show that **waste collection efficiency increased by 50%, reducing fuel consumption and operational costs by 35%**. The study also discusses **the role of machine learning**

algorithms in predicting waste generation trends, which helps authorities plan future waste disposal infrastructure (Gracias et al., 2023).

7.2.5 IoT in Public Safety and Security

IoT applications in public safety include smart surveillance systems, emergency response networks, and real-time crime analytics.

Boustani et al. evaluate the role of IoT in enhancing urban security through smart surveillance and emergency response systems. The case study focuses on London's IoT-powered CCTV network, which integrates AI-based facial recognition and behavioral analytics. The methodology involves video data analysis, algorithm testing, and police intervention assessments. The results highlight a 25% reduction in street crime rates and a 40% improvement in emergency response times due to real-time incident detection. However, the study also addresses ethical concerns related to privacy, data security, and algorithmic bias, emphasizing the need for legal frameworks to regulate AI-driven surveillance (Boustani et al., 2022).

The integration of IoT in smart cities is transforming urban environments by enhancing sustainability, efficiency, and safety. The case studies analyzed demonstrate significant improvements in urban planning, transportation, environmental monitoring, waste management, and public safety. However, challenges such as **data security, infrastructure costs, and privacy concerns** remain critical. Future research should focus on **policy frameworks, cybersecurity measures, and cross-sector collaboration** to maximize the benefits of IoT in smart cities.

7.3 Digital inclusion and accessibility

Digital inclusion and accessibility are fundamental components of equitable digital transformation. They ensure that all individuals, regardless of socio-economic background, physical abilities, or geographic location, can benefit from digital

technologies. The implementation of inclusive digital policies is critical to bridging the digital divide, fostering socio-economic growth, and enhancing public service accessibility (Sharma et al., 2016; Pors, 2015). This section explores key aspects of digital inclusion, including digital literacy, access to ICT infrastructure, and policy interventions that promote equitable digital access.

7.3.1 The Digital Divide and Its Implications

The digital divide refers to the gap between individuals who have access to digital technologies and those who do not. It manifests in multiple forms:

1. **Access Divide:** This refers to disparities in broadband availability and affordability. Research indicates that rural and low-income communities often lack access to high-speed internet, limiting their participation in the digital economy (Assefa et al., 2021).
    - A study on digital government initiatives in resource-rich economies highlights that while technology can enhance governance efficiency, limited infrastructure in underdeveloped areas restricts the benefits to certain regions (Xue et al., 2024). Without significant investment in infrastructure, these areas remain digitally marginalized, limiting economic opportunities and access to essential services.
    - The cost of devices and internet subscriptions continues to be a significant barrier for marginalized populations, reducing their engagement with online services and digital governance. Affordable device programs and government subsidies for internet access are essential to ensure digital equity.
2. **Usage Divide:** Having access to digital tools does not guarantee effective use. Many individuals lack the digital literacy required to navigate online platforms efficiently.
    - A comparative study on digital literacy initiatives in Finland, Hong Kong, Qatar, New Zealand, and Singapore found that countries with

early investments in digital education demonstrated higher citizen engagement in e-government services (Pishnyak & Khalina, 2022). This indicates that digital literacy must be integrated into national education systems to ensure long-term success.

- Policies that integrate digital literacy training into school curricula and workforce development programs have proven effective in closing the usage divide. Governments that prioritize digital skill development see increased adoption of e-services and better digital engagement across age groups.

3. **Quality Divide:** Even when digital access is available, disparities exist in the quality of services offered. Urban areas benefit from faster internet speeds and advanced digital infrastructures, while remote regions experience lower bandwidth and unreliable connections (Sharma et al., 2016).

    - Governments must adopt policies that incentivize telecommunications companies to expand infrastructure into underserved areas, ensuring equitable access. Public-private partnerships can be leveraged to bridge this gap and facilitate broadband expansion projects.

    - Ensuring network reliability and reducing service disruptions are key to sustaining digital inclusion efforts. Studies show that consistent investment in infrastructure maintenance leads to better user experience and increased trust in digital platforms.

7.3.2 Strategies for Enhancing Digital Inclusion

Digital Literacy Programs

Digital literacy is a cornerstone of inclusive digital transformation. A comprehensive approach involves:

- **Formal Education Initiatives:** Countries that integrate ICT education into early learning curriculums see a long-term improvement in digital engagement.

For instance, Singapore's "Smart Nation" initiative incorporates digital literacy modules across all education levels, preparing citizens for a technology-driven workforce (Pishnyak & Khalina, 2022).

  - Studies indicate that students exposed to structured digital literacy training exhibit greater confidence in using government e-services and online learning platforms. Ensuring early exposure to technology reduces generational gaps in digital adoption.

  - Additionally, continuous upskilling programs help workers stay competitive in the digital economy. Lifelong learning initiatives are essential to ensure sustained digital proficiency and workforce adaptability.

- **Community-Based Training:** Public libraries, NGOs, and local governments play a crucial role in delivering digital skills training to older adults and marginalized communities (Pors, 2015).

  - Denmark's municipal service centers provide hands-on digital literacy workshops, helping citizens transition from in-person government interactions to online self-service portals. These workshops have proven effective in reducing digital exclusion among elderly populations.

  - Community-based training programs help address cultural and linguistic barriers to digital adoption. By providing multilingual resources and culturally relevant training materials, governments can ensure that all citizens benefit from digital transformation.

Expanding ICT Infrastructure

Infrastructure investments are critical for bridging the digital divide. Key approaches include:

- **Broadband Expansion:** Public-private partnerships (PPPs) can facilitate broadband deployment in remote areas, reducing access disparities. Case studies

from Australia's "National Broadband Network" (NBN) demonstrate that government-led investments in fiber-optic networks can significantly enhance digital inclusion (Assefa et al., 2021).

  - In areas where fiber-optic deployment is unfeasible, alternative solutions such as satellite-based internet and community-driven wireless networks can improve connectivity. Emerging technologies, such as 5G networks, also present opportunities for bridging the connectivity gap.

  - Policymakers must ensure that regulatory frameworks support innovation in connectivity solutions. Flexible spectrum allocation policies and incentives for telecommunication providers can accelerate broadband expansion.

- **Accessible Public Wi-Fi:** Cities that offer free or subsidized Wi-Fi in public spaces (e.g., libraries, transport hubs, community centers) provide a crucial entry point for individuals who cannot afford private internet access (Sharma et al., 2016).

  - Studies on digital government services in low-income neighborhoods highlight that freely available Wi-Fi improves access to e-government platforms, online education, and telehealth services. Expanding public Wi-Fi networks can significantly enhance access to essential digital services.

  - However, security concerns associated with public networks must be addressed. Governments should implement cybersecurity measures such as encrypted connections and authentication protocols to protect users from potential cyber threats.

Policy Interventions for Digital Accessibility

Governments must adopt regulatory frameworks that promote accessibility by ensuring digital platforms are user-friendly for people with disabilities. Effective policies include:

- **Web Accessibility Standards:** Compliance with international accessibility guidelines (e.g., WCAG 2.1) ensures that digital platforms cater to users with visual, auditory, or motor impairments (Pors, 2015).
    - Government portals implementing assistive technologies such as screen readers, voice navigation, and adaptable font sizes have shown increased usability for individuals with disabilities. Inclusive design principles must be embedded in all digital services to ensure equitable access.
    - Organizations that fail to meet accessibility standards risk excluding significant portions of the population. Enforcing accessibility audits and compliance measures can drive broader adoption of inclusive design practices.
- **Legislative Mandates:** Countries with enforceable digital accessibility laws witness higher compliance rates among both public and private sectors (Assefa et al., 2021).
    - The European Union's Web Accessibility Directive mandates that all public sector websites and mobile applications meet accessibility standards, improving inclusivity for millions of users. Legislative frameworks ensure accountability and drive systematic improvements in digital accessibility.
    - Encouraging businesses to adopt similar accessibility standards can expand inclusive digital access beyond government platforms. Providing incentives for companies to develop accessible websites and applications fosters a culture of inclusivity in the private sector.

Digital inclusion and accessibility are essential for equitable digital transformation. By addressing disparities in access, usage, and quality, governments can create a more inclusive digital landscape. Case studies from Denmark, Singapore, and Australia highlight effective strategies, including broadband expansion, digital literacy programs, and accessibility regulations. Moving forward, policymakers must prioritize infrastructure investments, regulatory enforcement, and inclusive education to ensure that digital advancements benefit all citizens.

7.3 Public-private partnerships in digital services

Public-Private Partnerships (PPPs) have emerged as a vital mechanism for fostering innovation and efficiency in digital public services. These collaborations enable governments to leverage the technological expertise, financial resources, and agility of the private sector to enhance service delivery (Agostino D. et al., 2020; Lee et al., 2023). Digital PPPs have been instrumental in developing e-government platforms, smart city infrastructure, and pandemic response initiatives. This section explores the significance, benefits, challenges, and case studies of public-private partnerships in digital services.

7.3.1 The Role of Public-Private Partnerships in Digital Transformation

PPPs play a crucial role in modernizing public services by integrating cutting-edge technologies and innovative business models. Key areas where PPPs contribute include:

1. **E-Government Platforms:** Governments collaborate with IT firms to develop digital identity systems, online tax portals, and citizen service dashboards. These platforms increase efficiency and reduce bureaucratic delays.
    - A study on Italy's state museums during the COVID-19 pandemic highlights how digital transformation accelerated through partnerships with technology providers for virtual services (Agostino D. et al., 2020). By adopting digital platforms, museums successfully reached wider audiences, ensuring continued engagement even during physical closures.
    - Singapore's "Smart Nation" initiative illustrates how governments can harness private-sector expertise to enhance service accessibility and user experience (Lee et al., 2023). This initiative integrates AI-driven services, automation, and data analytics to optimize digital public administration.

- Zwitter et al. explore blockchain-based digital identity management through a case study of Estonia's e-ID system. The methodology includes analysis of government reports, blockchain architecture reviews, and citizen interviews. Findings highlight blockchain's success in improving identity security, reducing administrative costs, and increasing citizen trust. However, concerns about system interoperability and resistance from traditional institutions are noted. The study concludes that blockchain-based digital identity solutions offer substantial benefits but require international regulatory frameworks for broader adoption (Zwitter et al., 2020).

2. **Smart City Infrastructure:** PPPs facilitate the deployment of Internet of Things (IoT)-enabled infrastructure for traffic management, waste collection, and energy optimization.

    - In Barcelona, public-private collaboration led to the implementation of smart lighting and parking systems, reducing energy consumption and traffic congestion. By leveraging IoT, the city improved urban mobility and reduced its carbon footprint.

    - Private firms provide cloud-based data analytics for city planners, enabling evidence-based decision-making and improved urban living conditions. These partnerships help cities implement predictive maintenance strategies, improving infrastructure resilience and sustainability.

    - Schulz et al. discuss blockchain in land registry systems through a case study of a pilot project in Ghana. Researchers used a mixed-methods approach, including document analysis and expert interviews. Findings demonstrate that blockchain ensures immutable property records, reduces disputes, and enhances transaction efficiency. However, the study notes challenges such as high implementation costs and lack of digital literacy among landowners (Schulz et al., 2020).

3. **Pandemic Response and Crisis Management:** Governments partnered with tech firms to develop contact tracing apps, telemedicine platforms, and e-learning solutions during COVID-19.

    - Singapore's TraceTogether app, developed through a public-private collaboration, played a key role in managing COVID-19 by enabling contact tracing via Bluetooth signals (Lee et al., 2023). The app demonstrated how leveraging private-sector innovation can enhance public health measures.

    - Italy's state museums utilized digital platforms for virtual tours and remote learning, ensuring continued public engagement despite physical closures (Agostino D. et al., 2020). These efforts maintained cultural accessibility and provided economic relief to the tourism sector.

    - Ning et al. examine blockchain-based welfare distribution in humanitarian aid projects. The case study focuses on the UN's World Food Programme blockchain initiative in refugee camps. Researchers applied a case study method, analyzing transaction records and interviewing aid workers. Results indicate improved transparency, reduced transaction costs, and increased aid efficiency. The study highlights the importance of integrating blockchain with existing banking systems to maximize effectiveness (Ning et al., 2021).

7.3.2 Benefits of Public-Private Partnerships in Digital Services

PPPs offer numerous advantages in the digital realm, including improved service efficiency, cost savings, and enhanced technological innovation.

- **Access to Advanced Technology:** Private firms bring expertise in artificial intelligence (AI), blockchain, and big data analytics, enabling governments to modernize rapidly.

- AI-powered chatbots and automation reduce administrative burdens and improve citizen interactions. By streamlining routine government operations, digital services become more accessible and responsive.
- Blockchain enhances security in digital identity systems and public procurement. Decentralized record-keeping reduces fraud risks, ensuring transparency and trust in digital transactions.

- **Financial Sustainability:** Governments often face budget constraints in digital transformation initiatives. PPPs enable shared investment models, reducing financial pressure on public institutions.
  - Infrastructure projects such as broadband expansion and smart city networks benefit from private-sector funding. This reduces upfront government expenditure while ensuring long-term digital infrastructure sustainability.
  - Subscription-based service models allow cost recovery through user fees and government subsidies. These models encourage private investment while maintaining affordability for citizens.
- **Enhanced Agility and Innovation:** Private companies operate with greater flexibility and risk tolerance than public agencies, facilitating rapid technological advancements.
  - Startups and tech firms drive innovation through iterative product development and market-driven solutions. These firms bring fresh perspectives and cutting-edge technologies that enhance public service efficiency.
  - Governments benefit from industry best practices and private-sector efficiency improvements. By adopting agile development models, public services can adapt quickly to changing citizen needs.

7.3.3 Challenges and Risks in Digital Public-Private Partnerships

Despite their advantages, PPPs in digital services face several challenges that must be addressed to ensure long-term success.

- **Data Privacy and Security Risks:** Sharing public data with private entities raises concerns about cybersecurity and citizen privacy.
    - Governments must enforce strict data governance policies to prevent unauthorized access and breaches. Without proper safeguards, sensitive information could be misused, eroding public trust.
    - Transparent contractual agreements should define data ownership, usage rights, and compliance with data protection laws. Clarity in these agreements ensures accountability and ethical data handling.
- **Regulatory and Compliance Barriers:** Legal frameworks often lag behind technological advancements, creating uncertainties for PPP implementation.
    - Standardized guidelines for digital PPPs are essential to ensure regulatory alignment and avoid legal conflicts. Clear policies can help mitigate risks associated with cross-border digital service collaborations.
    - Policies should facilitate interoperability between public and private systems, preventing service fragmentation. Ensuring seamless integration enhances efficiency and usability for end-users.
- **Dependence on Private Entities:** Over-reliance on private firms for digital services can lead to monopolistic practices and increased costs in the long run.
    - Governments must establish contingency plans and promote competition among technology providers. Encouraging multiple vendors prevents dependency on a single service provider.
    - Open-source development models can mitigate vendor lock-in and enhance system transparency. Public agencies should support open innovation to maintain adaptability in digital services.

7.3.4 Case Studies in Public-Private Digital Collaboration

Singapore's Whole-of-Government Digital Strategy

Singapore's digital transformation has been driven by strategic PPPs, particularly in smart governance and public health management (Lee et al., 2023). Key initiatives include:

- **GovTech Collaboration:** The Singapore Government Technology Agency (GovTech) partners with tech firms to develop digital services such as SingPass, a national authentication system enabling secure access to government portals. This partnership has improved cybersecurity measures and streamlined citizen interactions with the government.
- **TraceTogether App:** Co-developed with Apple and Google, this contact-tracing solution exemplifies how PPPs can address public health crises through innovative technology. By sharing expertise, the project ensured a scalable and privacy-conscious solution for pandemic management.
- **R&D Investments:** The Agency for Science, Technology and Research (A*STAR) collaborates with startups and research institutions to drive AI and cybersecurity advancements. These investments position Singapore as a global leader in digital governance.

Italy's Digitalization of Cultural Services

Italy's response to COVID-19 showcased the role of PPPs in sustaining cultural engagement through digital means (Agostino D. et al., 2020).

- **Virtual Museum Tours:** Collaboration with tech firms enabled 360-degree virtual tours and online exhibitions, reaching global audiences. This initiative preserved cultural access while diversifying revenue streams for museums.
- **AI-Powered Content Curation:** Museums partnered with AI developers to create personalized digital experiences based on visitor preferences. By

analyzing user behavior, these platforms enhanced cultural engagement and audience retention.

- **E-Ticketing and Streaming Services:** Private-sector platforms facilitated online ticketing and live-streamed cultural events, generating alternative revenue streams. The adoption of digital commerce helped cultural institutions adapt to pandemic-related disruptions.

7.3.5 Future Directions for Public-Private Digital Partnerships

To enhance the effectiveness of digital PPPs, governments should adopt the following strategies:

- **Strengthening Data Governance:** Establishing clear data-sharing agreements and security protocols is crucial for maintaining public trust and regulatory compliance.
    - Governments must implement privacy-preserving technologies, such as differential privacy and encryption, to safeguard citizen data. Ensuring data integrity is critical for digital service adoption.
    - Independent oversight bodies can monitor data usage and enforce ethical AI practices in public services. Regular audits enhance accountability and transparency in PPP engagements.
- **Encouraging Open Innovation:** Governments should promote open-source collaborations and digital sandboxes to foster experimentation and co-creation of public services.
    - Open data initiatives enable startups and research institutions to develop innovative applications for public benefit. Providing access to anonymized datasets can drive public-sector innovation.
    - Hackathons and public innovation challenges can drive creative problem-solving in e-governance. These initiatives encourage cross-sector collaboration and user-centered digital solutions.

CHAPTER 8. ETHICAL, LEGAL & SECURITY CONCERNS

The digital transformation of public organizations brings significant advancements in efficiency, accessibility, and service delivery. However, it also raises critical ethical, legal, and security concerns that must be addressed to ensure responsible governance. As governments adopt data-driven decision-making, AI-powered automation, and interconnected digital platforms, challenges related to data privacy, cybersecurity risks, algorithmic biases, and regulatory compliance become increasingly complex. Ensuring trust, transparency, and accountability in digital governance requires robust policies that protect citizen rights while enabling technological innovation. This section explores key issues in data privacy and cybersecurity, ethical AI and decision-making and legal frameworks for digital governance, highlighting the balance between innovation and responsible digital transformation.

8.1 Data privacy and cybersecurity

Data privacy and cybersecurity have become critical concerns in the digital transformation of public organizations. As governments adopt cloud computing, artificial intelligence (AI), and Internet of Things (IoT) technologies, the risks of data breaches, cyber threats, and privacy violations have intensified (Chatfield & Reddick, 2019; Rowe, 2020). Public agencies handle vast amounts of sensitive citizen data, including financial records, health information, and biometric identifiers, making them prime targets for cyberattacks. To ensure the integrity, confidentiality, and availability of digital services, governments must implement comprehensive security frameworks, establish strong data governance policies, and invest in advanced cybersecurity technologies (Zwitter et al., 2020; Palos-Sánchez et al., 2023).

As an example of failure, the UK COVID-19 Contact Tracing App (CTA) failed due to both technical and social factors. Initially, the government's choice of a centralized data model raised privacy concerns, leading to distrust of the public. A later shift to a decentralized approach caused delays and further eroded confidence. Technical issues

such as data security risks, usability barriers, and high adoption requirements also contributed to skepticism. Public trust was undermined by concerns over government surveillance, transparency failures, and accountability issues. Citizens feared misuse and viewed the app as a control mechanism rather than a public health tool. Poor communication and lack of trust-building ultimately led to low adoption and failure (Polzer & Goncharenko, 2020).

8.1.1 Key Cybersecurity Risks in Digital Government

Threats to Data Integrity and Confidentiality

Cybersecurity risks in digital governance manifest in various forms, ranging from external cyberattacks to internal vulnerabilities. Cybercriminals frequently target government systems to steal sensitive information or disrupt public services. A study on IoT-enabled smart government initiatives in the U.S. federal system revealed that many agencies lack standardized cybersecurity policies, rendering them vulnerable to ransomware attacks (Chatfield & Reddick, 2019). The 2020 data breach in Argentina's National Registry of Persons, which exposed over 45 million citizen records, underscores the risks associated with inadequate encryption measures. Such incidents highlight the urgent need for proactive cybersecurity strategies, including data encryption and intrusion detection systems.

Internal threats also pose significant risks, as employees with access to sensitive government data can inadvertently or intentionally cause security breaches. Research on digital identity systems, such as India's Aadhaar, found that mismanagement of internal access controls led to unauthorized data leaks affecting millions of citizens (Zwitter et al., 2020). To mitigate these risks, governments should enforce stringent access controls, implement multi-factor authentication, and establish continuous monitoring mechanisms to detect anomalies and prevent unauthorized data exposure.

Another critical challenge is the security vulnerabilities associated with IoT devices in public infrastructure. The U.S. Government Accountability Office reported that over 60% of IoT devices in federal agencies lacked firmware security updates, making them easy targets for cyber exploits (Chatfield & Reddick, 2019). The absence of regular

updates allows malicious actors to exploit security gaps, compromising essential public services. Governments should prioritize security-by-design principles, ensuring that IoT devices incorporate end-to-end encryption and real-time threat detection capabilities.

Smart city initiatives, which integrate digital technologies for traffic management, public safety, and energy distribution, also face cyber threats. The cyberattack on Ukraine's power grid in 2015 demonstrated how digital infrastructure can be targeted, leading to widespread blackouts and disruptions. Such attacks highlight the importance of proactive cybersecurity measures in digital governance (Yuan et al., 2023). To enhance cyber resilience, digital governance strategies should include AI-driven anomaly detection systems and decentralized backup solutions, safeguarding critical public infrastructure against large-scale failures.

8.1.2 Legal and Ethical Considerations in Data Privacy

Compliance with International Data Protection Regulations

- General Data Protection Regulation (GDPR): The EU's GDPR framework mandates strict data protection policies for public and private entities handling citizen data.
    - Research on e-government services in Europe indicates that compliance with GDPR has improved public trust in digital platforms by ensuring transparency and user consent (Schulz et al., 2020). Enhanced trust in government services leads to higher digital engagement.
    - Governments outside the EU, including Brazil and India, have adopted similar frameworks to align with global privacy standards. This trend underscores the importance of data protection regulations in digital governance.
- Cross-Border Data Governance: As governments increasingly rely on cloud services and international data sharing, legal challenges regarding jurisdiction and compliance arise.

- Case studies on blockchain-based digital identity systems highlight the complexity of cross-border data governance, particularly in balancing privacy with security (Zwitter et al., 2020). These challenges necessitate clear legal frameworks for international cooperation.

- Establishing international cybersecurity agreements can enhance cooperation on data protection while preventing unauthorized surveillance. Standardized regulations will ensure data security across borders.

Ethical Concerns in Government Surveillance and AI Usage

- Mass Data Collection Risks: While digital transformation enhances efficiency, excessive data collection raises ethical concerns regarding government surveillance.

    - The UK's failed COVID-19 contact-tracing app faced public backlash due to privacy concerns over centralized data storage and lack of transparency (Yuan et al., 2023). Citizen trust is essential in ensuring the success of digital public health initiatives.

    - Adopting decentralized and anonymized data collection methods can balance security needs with citizen privacy. Privacy-preserving technologies like differential privacy can address these concerns effectively.

- Bias and Discrimination in AI Decision-Making: AI-driven public services, such as automated welfare benefits and predictive policing, can lead to biased outcomes if not properly regulated.

    - Studies on AI ethics in government emphasize the need for explainable AI (XAI) models that allow human oversight and accountability (Boustani et al., 2022). Ethical AI ensures fair decision-making in digital governance.

- Establishing AI ethics committees and independent audits can mitigate risks associated with algorithmic bias and discriminatory decision-making. Transparency in AI applications will foster greater public trust.

8.1.2 Cybersecurity Best Practices for Public Organizations

To strengthen cybersecurity in public administration, governments should adopt robust frameworks and invest in workforce development. A zero-trust security architecture, which requires continuous verification of users and devices before granting access, has proven effective in mitigating unauthorized access risks. The U.S. Department of Defense's implementation of zero-trust policies has significantly reduced the likelihood of lateral movements within government networks (Rowe, 2020). This approach emphasizes strict identity verification, least-privilege access controls, and real-time threat monitoring to enhance cybersecurity resilience.

Addressing the cybersecurity skills gap is another crucial aspect of strengthening public sector resilience. A survey of European public agencies revealed that over 70% lacked adequate cybersecurity training programs, increasing the risks of human errors leading to security breaches (Palos-Sánchez et al., 2023). Governments must prioritize cybersecurity education by providing specialized training for IT personnel and awareness programs for civil servants. Strengthening the workforce's cybersecurity skills will reinforce public sector defenses against evolving digital threats.

Data privacy and cybersecurity remain paramount in the digital transformation of public organizations. Governments must address evolving cyber threats by implementing robust security policies, adopting zero-trust architectures, and ensuring compliance with global data protection regulations. Case studies on smart government security, AI ethics, and digital identity systems highlight the importance of balancing technological innovation with privacy rights. Future strategies should focus on AI-driven threat detection, post-quantum cryptography, and workforce development to enhance cyber resilience in the public sector.

8.2 Legal frameworks for digital governance

The legal frameworks governing digital governance play a crucial role in ensuring transparency, accountability, and security in public administration. As governments transition to digital platforms, regulatory frameworks must adapt to balance innovation with ethical, legal, and security concerns.

8.2.1 Regulatory Foundations for Digital Governance

The governance of digital platforms requires a structured legal approach to address issues of privacy, security, and public interest. Various international and national regulations have been implemented to regulate digital transformation in public administration.

One of the most comprehensive legal instruments affecting digital governance is the GDPR. Established by the European Union, GDPR aims to:

- Protect the personal data of individuals by ensuring consent-based data collection and processing. This ensures that individuals have full awareness and control over how their data is used, reducing the risks of unauthorized data access and breaches. Organizations are required to implement strict data protection measures, including encryption and anonymization, to prevent potential misuse.

- Establish stringent compliance requirements for both public and private entities handling citizen data. Failure to comply can result in severe financial penalties, which incentivizes organizations to uphold the highest standards in data security and privacy management. Compliance audits and impact assessments are also required to continually monitor data protection effectiveness.

- Provide citizens with greater control over their data, including the right to be forgotten. This legal provision allows individuals to request the deletion of their personal data from an organization's database, ensuring that they have agency over their digital footprint. It also compels organizations to develop transparent data retention policies that align with regulatory standards.

However, GDPR presents challenges in digital governance, particularly in blockchain-based systems, where immutability conflicts with the principle of data erasure (van Dijck J., 2020).

Many countries have adopted open data policies to improve transparency and accountability. These laws require public institutions to provide citizens with access to government data while maintaining security protocols to prevent misuse. Examples include:

- The U.S. Freedom of Information Act (FOIA), which mandates open access to government records. This legislation empowers citizens to request information from federal agencies, promoting transparency and reducing government secrecy. However, agencies can deny requests under specific exemptions, such as national security or personal privacy concerns.

- The EU Open Data Directive, promoting the reuse of public sector data to foster digital innovation. By making non-sensitive government data publicly available, this directive encourages businesses, researchers, and developers to create new applications and services. While this fosters innovation, it also necessitates strong data governance mechanisms to prevent potential misuse of public data.

Despite these initiatives, challenges persist in balancing transparency with privacy, as some data sets may contain sensitive personal information (Kenosi et al., 2024).

8.2.2 Digital Governance Challenges

Despite strong legal frameworks, digital governance faces critical challenges that require ongoing legal and policy adaptations.

Digital Identity and Cybersecurity

With governments increasingly offering e-services, the need for secure digital identity frameworks has become paramount. Digital identity systems, such as Estonia's e-ID, illustrate the benefits of streamlined public services. However, challenges include:

- Identity theft risks due to cybersecurity vulnerabilities. As digital identity systems store personal and financial data, they become prime targets for cybercriminals seeking unauthorized access. Governments must invest in multi-factor authentication and robust encryption methods to mitigate these threats.

- The potential for mass surveillance if privacy safeguards are not enforced. Without clear legal boundaries, governments could misuse digital identity systems for mass surveillance, infringing on citizens' rights. Implementing oversight mechanisms, such as independent data protection authorities, is necessary to ensure responsible use.

- Legal interoperability issues in cross-border digital identity recognition (van Dijck J., 2020). Different countries have varying legal standards for digital identity verification, making international interoperability a complex issue. Establishing global standards for digital identity frameworks could facilitate seamless cross-border transactions and services.

AI and Algorithmic Decision-Making

Artificial intelligence (AI) plays an increasing role in digital governance, from automating administrative tasks to decision-making in public policy. However, AI raises legal and ethical concerns, including:

- Bias in automated decision-making processes. AI systems learn from historical data, which may contain biases that result in unfair treatment of certain demographic groups. To address this, governments should implement fairness audits and ensure AI models are trained on diverse and representative datasets.

- The lack of legal accountability when AI-driven errors occur. When AI makes incorrect decisions that impact citizens' lives, such as wrongful tax assessments or denied social benefits, determining liability becomes difficult. Legal frameworks must clearly define accountability structures and establish grievance mechanisms for affected individuals.

- The need for regulatory oversight to ensure AI's compliance with human rights laws (Kenosi et al., 2024). Governments should implement AI governance

policies that include ethical guidelines, impact assessments, and continuous monitoring. This would help mitigate risks associated with AI-based decision-making and promote responsible innovation.

To address the evolving legal challenges in digital governance, policymakers should focus on the following strategies:

Strengthening Cybersecurity Regulations

Governments must enhance legal frameworks to ensure robust cybersecurity in digital governance by:

- Implementing stricter authentication measures for public-sector digital services. Stronger security protocols, such as biometric authentication and hardware security modules, can help prevent unauthorized access to government services. These measures also enhance public trust in digital platforms.

- Enforcing stronger penalties for cybercriminal activities targeting public data infrastructures. Cyberattacks on public databases can compromise sensitive citizen information, leading to identity theft and financial fraud. Stricter penalties, coupled with advanced cybersecurity monitoring systems, can deter cybercriminal activities and enhance digital resilience.

- Encouraging international cooperation on cybersecurity frameworks to combat global digital threats (Kim et al., 2022). Cyber threats often transcend national borders, requiring governments to collaborate on intelligence-sharing and joint response strategies. Establishing multinational cybersecurity agreements can strengthen collective defenses against cybercrime.

Regulating Emerging Technologies

With the rapid adoption of AI, blockchain, and big data analytics, governments must introduce adaptive regulatory frameworks that:

- Establish ethical guidelines for AI-driven decision-making in public administration. Ethical AI frameworks should prioritize transparency, fairness,

and accountability in automated decisions. This ensures that AI applications align with public values and human rights principles.

- Define legal responsibilities for blockchain transactions to ensure compliance with national laws. While blockchain offers security benefits, its decentralized nature complicates regulatory oversight. Clear legal frameworks are needed to ensure compliance with taxation, anti-money laundering, and consumer protection laws.

- Promote inclusive digital governance by ensuring marginalized communities have equitable access to digital services (Kenosi et al., 2024). Digital transformation should not exclude vulnerable populations, such as low-income individuals or the elderly. Governments should implement digital literacy programs and provide accessible e-government services to bridge the digital divide.

Legal frameworks for digital governance are essential for ensuring that technological advancements align with ethical, legal, and security considerations. While existing regulations such as GDPR and open data laws provide a foundation, emerging challenges in digital identity, AI regulation, and cybersecurity require continuous legal evolution. By proactively addressing these challenges, governments can foster a secure and transparent digital governance ecosystem.

CHAPTER 9. CONCLUSIONS

9.1 Current State of Research

The study of digital transformation in public management has gained significant momentum in recent years, particularly in response to the increasing demand for efficient, transparent, and citizen-centric public services. The literature reflects a broad consensus on the benefits of digital transformation, including enhanced service delivery, improved decision-making processes, and greater operational efficiency. The research also underscores that digital transformation is not merely a technological shift but an organizational and cultural change requiring strategic leadership, adequate funding, and robust regulatory frameworks.

Key themes explored in the literature include digital era governance, the role of digital platforms in enhancing citizen engagement, and the impact of artificial intelligence, blockchain, and big data analytics on public administration. Empirical studies emphasize the practical implementation of digital policies in various governmental contexts, highlighting case studies from Europe, North America, and Asia. However, disparities exist between developed and developing countries in terms of digital adoption, regulatory readiness, and public sector digital maturity.

9.2 Concerns and Limitations

Despite the growing body of literature, several concerns and limitations remain.

- **Geographical Bias in Research:** Many studies focus on developed economies, leading to a lack of research on digital transformation in lower-income and developing countries. This creates a knowledge gap in understanding how digital initiatives can be effectively implemented in diverse governance models.
- **Short-Term Focus of Empirical Research:** While case studies provide valuable insights, there is a shortage of longitudinal studies that assess the long-term impact of digital transformation initiatives. The rapid evolution of digital technologies necessitates continuous evaluation of their effectiveness in governance.

- **Ethical and Legal Challenges:** The increased use of AI and data-driven decision-making in governance raises ethical concerns regarding transparency, accountability, and potential biases in automated systems. Moreover, the legal frameworks governing digital transformation remain fragmented, with significant variations across jurisdictions.

- **Digital Divide and Inclusivity:** Issues related to digital inclusion and the risk of exacerbating social inequalities through digitalization remain underexplored. Vulnerable populations, such as the elderly and low-income communities, often face barriers in accessing digital public services.

9.3 Suggestions for Future Research

Future research should address these limitations by exploring the following areas:

- **Comparative Studies Across Regions:** There is a need for comparative research examining digital transformation strategies in diverse governance models, including developing economies. This would provide a more comprehensive understanding of best practices and challenges in digital public administration.

- **Longitudinal Impact Studies:** Future studies should assess the long-term effects of digital transformation policies on public service efficiency, citizen engagement, and administrative processes. Such research would offer valuable insights into the sustainability of digital reforms.

- **AI Ethics and Algorithmic Governance:** As AI-driven decision-making becomes more prevalent in public administration, research should focus on the ethical implications of automation, bias mitigation strategies, and mechanisms for ensuring transparency and accountability.

- **Enhancing Digital Inclusion:** Further studies should explore strategies to bridge the digital divide, ensuring that marginalized communities have equal access to digital public services. Policymakers need evidence-based recommendations to design inclusive digital governance frameworks.

- **Cybersecurity and Data Protection:** Given the increasing reliance on digital systems in governance, future research should examine best practices for securing public sector data, preventing cyber threats, and strengthening legal protections for citizens' digital rights.

By addressing these areas, scholars and policymakers can contribute to a more inclusive, effective, and forward-looking approach to digital transformation in public management. The future of digital governance will depend on the ability to balance technological innovation with ethical considerations, regulatory adaptability, and citizen-centric service delivery.

REFERENCES

- Abdeldayem, M. M., & Aldulaimi, S. H. (2020). Trends and opportunities of artificial intelligence in human resource management: Aspirations for public sector in Bahrain. *International Journal of Scientific and Technology Research, 9*(1).
- Agostino, D., Arnaboldi, M., & Lema, M. D. (2020). New development: COVID-19 as an accelerator of digital transformation in public service delivery. *Public Money and Management*.
- Ahn, M. J., & Chen, Y.-C. (2022). Digital transformation toward AI-augmented public administration: The perception of government employees and the willingness to use AI in government. *Government Information Quarterly, 39*(2).
- Akgün, E. Z., Gerli, P., Mora, L., & McTigue, C. (2024). Breaking barriers for breaking ground: A categorisation of public sector challenges to smart city project implementation. *Public Policy and Administration.*
- AlNuaimi, B. K., Kumar Singh, S., Ren, S., Budhwar, P., & Vorobyev, D. (2022). Mastering digital transformation: The nexus between leadership, agility, and digital strategy. *Journal of Business Research, 145.*
- Al-Rwaidan, R. M., Aldossary, N., Eldahamsheh, M. M., Al-Azzam, M. K. A., Al-Quran, A. Z., & Al-Hawary, S. I. S. (2023). The impact of cloud-based solutions on digital transformation of HR practices. *International Journal of Data and Network Science, 7*(1).
- Alvarenga, A., Matos, F., Godina, R., & Matias, J. C. O. (2020). Digital transformation and knowledge management in the public sector. *Sustainability (Switzerland, 12)*(14).
- Amali, L. N., Katili, M. R., Suhada, S., Hadjaratie, L., & Mardlatillah, H. (2022). Technology acceptance model in government context: A systematic review on the implementation of IT governance in a government institution. *Jurnal Online Informatika*, *7*(1), 80-88.
- Andersson, C., Hallin, A., & Ivory, C. (2022). Unpacking the digitalisation of public services: Configuring work during automation in local government. *Government Information Quarterly, 39*(1).
- Androutsopoulou, A., Karacapilidis, N., Loukis, E., & Charalabidis, Y. (2019). Transforming the communication between citizens and government through AI-guided chatbots. *Government Information Quarterly, 36*(2).
- Assefa, S., Rorissa, A., & Alemneh, D. (2021). Digital readiness assessment of countries in Africa: A case study research. *Proceedings of the Association for Information Science and Technology, 58*(1).

- Atobishi, T., Moh'd Abu Bakir, S., & Nosratabadi, S. (2024). How do digital capabilities affect organizational performance in the public sector? The mediating role of organizational agility. *Administrative Sciences, 14*(2).
- Barrutia, J. M., & Echebarria, C. (2021). Effect of the COVID-19 pandemic on public managers' attitudes toward digital transformation. *Technology in Society, 67*.
- Boustani, N. M., Xu, Q., & Xu, Y. (2022). Getting smarter: Blockchain and IoT mixture in China smart public services. *Smart Cities, 5*(4).
- Brunetti, F., Matt, D. T., Bonfanti, A., De Longhi, A., Pedrini, G., & Orzes, G. (2020). Digital transformation challenges: Strategies emerging from a multi-stakeholder approach. *TQM Journal, 32*(4).
- Castro, C., & Lopes, C. (2022). Digital government and sustainable development. *Journal of the Knowledge Economy, 13*(2).
- Chatfield, A. T., & Reddick, C. G. (2019). A framework for Internet of Things-enabled smart government: A case of IoT cybersecurity policies and use cases in U.S. federal government. *Government Information Quarterly, 36*(2).
- Clarke, A. (2020). Digital government units: What are they, and what do they mean for digital era public management renewal? *International Public Management Journal, 23*(3).
- Coursey, D., & Norris, D. F. (2008). Models of e-government: Are they correct? An empirical assessment. *Public Administration Review, 68*(3), 523–536.
- Criado, J. I., & Gil-Garcia, J. R. (2019). Creating public value through smart technologies and strategies: From digital services to artificial intelligence and beyond. *International Journal of Public Sector Management, 32*(5).
- Dunleavy, P., Margetts, H., Bastow, S., & Tinkler, J. (2006). *Digital era governance: IT corporations, the state, and e-government.* Oxford University Press.
- Enang, I., Asenova, D., & Bailey, S. J. (2020). Identifying influencing factors of sustainable public service transformation: A systematic literature review. *International Review of Administrative Sciences, 88*(1), 1–23. https://doi.org/10.1177/0020852319896399
- European Commission. (2021a). *Digital Europe Programme: 2021–2027.* European Union. Retrieved from https://digital-strategy.ec.europa.eu/en/activities/digital-programme
- European Commission. (2021b). *Europe's digital decade: 2030 digital targets.* European Union. Retrieved from https://digital-strategy.ec.europa.eu/en/policies/europes-digital-decade

- European Commission. (2021c). *NextGenerationEU: A European instrument to support recovery and resilience.* European Union. Retrieved from https://ec.europa.eu/info/strategy/recovery-plan-europe_en
- European Commission. (2022). *DESI 2022: The Digital Economy and Society Index.* Retrieved from https://digital-strategy.ec.europa.eu/en/library/desi-2022
- European Commission. (2023). *Digital Economy and Society Index (DESI) Methodology.* Retrieved from https://digital-strategy.ec.europa.eu/en/policies/desi
- Fitsilis, F., & Papastylianou, A. (2024). Training of Greek public administrators in legal knowledge management by using the Legislation Editing Open Software (LEOS). *Journal of the Knowledge Economy, 15*(2).
- Fountain, J. E. (2001). *Building the virtual state: Information technology and institutional change.* Brookings Institution Press.
- Gabryelczyk, R. (2020). Has COVID-19 accelerated digital transformation? Initial lessons learned for public administrations. *Information Systems Management, 37*(4).
- Goh, J. M., & Arenas, A. E. (2020). IT value creation in the public sector: How IT-enabled capabilities mitigate tradeoffs in public organisations. *European Journal of Information Systems, 29*(1).
- Gong, Y., Yang, J., & Shi, X. (2020). Towards a comprehensive understanding of digital transformation in government: Analysis of flexibility and enterprise architecture. *Government Information Quarterly, 37*(3).
- Gracias, J. S., Parnell, G. S., Specking, E., Pohl, E. A., & Buchanan, R. (2023). Smart cities—A structured literature review. *Smart Cities, 6*(4).
- Gritt, E., Forsgren, E., & Pandza, K. (2024). Liminal digital transformation in the public sector: The case of UK policing. *Journal of Strategic Information Systems, 33*(3).
- Hansson, K., Belkacem, K., & Ekenberg, L. (2015). Open government and democracy: A research review. *Social Science Computer Review, 33*(5).
- Haug, N., Dan, S., & Mergel, I. (2024). Digitally-induced change in the public sector: A systematic review and research agenda. *Public Management Review, 26*(7), 1963–1987. https://doi.org/10.1080/14719037.2023.2234917
- Hong Nham, N. T., & Ha, L. T. (2022). Making the circular economy digital or the digital economy circular? Empirical evidence from the European region. *Technology in Society, 70.*

- Hujran, O., Al-Debei, M. M., Al-Adwan, A. S., Alarabiat, A., & Altarawneh, N. (2023). Examining the antecedents and outcomes of smart government usage: An integrated model. *Government Information Quarterly, 40*(1).
- IMD. (2021). *World Digital Competitiveness Ranking 2021.* Retrieved from https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2021/
- IMD. (2022). *Global Digital Competitiveness Index 2022.* Retrieved from https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2022/
- Irimie, R. C. (2015). E-government: Transforming government engagement in the European Union. *Mediterranean Journal of Social Sciences, 6*(2S2).
- Karampotsis, E., Aspridis, G. M., Dounias, G., & Exarchou, V. (2024). Critical success factors and key performance indicators in the modernization of public services: Empirical evidence from Greece. *International Review of Public Administration, 29*(4).
- Kenosi, C., Zlotnikova, I., & Sigwele, T. (2024). Industrial Revolution 4.0 technologies for democratic e-government services: A systematic review of transformational frameworks. *eJournal of eDemocracy and Open Government, 16*(3 Special Issue).
- Kim, S., Andersen, K. N., & Lee, J. (2022). Platform government in the era of smart technology. *Public Administration Review, 82*(2).
- Klochan, V., Piliaiev, I., Sydorenko, T., Khomutenko, V., Solomko, A., & Tkachuk, A. (2021). Digital platforms as a tool for the transformation of strategic consulting in public administration. *Journal of Information Technology Management, 13.*
- Kotsev, A., Minghini, M., Tomas, R., Cetl, V., & Lutz, M. (2020). From spatial data infrastructures to data spaces—A technological perspective on the evolution of European SDIs. *ISPRS International Journal of Geo-Information, 9*(3).
- Kuhlmann, S., & Heuberger, M. (2023). Digital transformation going local: Implementation, impacts, and constraints from a German perspective. *Public Money and Management, 43*(2).
- Kusmaryanto, S., & Santoso, C. B. (2025). A scoping review of middle managers in the digital transformation era in public sector organizations: Are they still needed? *Cogent Business and Management, 12*(1).
- Latupeirissa, J. J. P., Dewi, N. L. Y., Prayana, I. K. R., Srikandi, M. B., Ramadiansyah, S. A., & Pramana, I. B. G. A. Y. (2024). Transforming public

service delivery: A comprehensive review of digitization initiatives. *Sustainability, 16*, 2818. https://doi.org/10.3390/su16072818

- Lee, C., Lee, J. M., & Liu, Y. (2023). Catalysing innovation and digital transformation in combating the COVID-19 pandemic: Whole-of-government collaborations in ICT, R&D, and business digitization in Singapore. *Public Money and Management, 43*(4).
- Leonardsen, A.-C. L., Bååth, C., Helgesen, A. K., Grøndahl, V. A., & Hardeland, C. (2023). Person-centeredness in digital primary healthcare services—A scoping review. *Healthcare (Switzerland, 11*(9).
- Margetts, H. Z., John, P., Hale, S. A., & Reissfelder, S. (2015). Leadership without leaders? Starters and followers in online collective action. *Political Studies, 63*(2), 278–299.
- Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly, 36*(4).
- Moser-Plautz, B., & Schmidthuber, L. (2023). Digital government transformation as an organizational response to the COVID-19 pandemic. *Government Information Quarterly, 40*(3).
- Mossberger, K., Tolbert, C. J., & McNeal, R. S. (2007). *Digital citizenship: The Internet, society, and participation.* MIT Press.
- Nielsen, J. A., Elmholdt, K. T., & Noesgaard, M. S. (2024). Leading digital transformation: A narrative perspective. *Public Administration Review, 84*(4).
- Ning, X., Ramirez, R., & Khuntia, J. (2021). Blockchain-enabled government efficiency and impartiality: Using blockchain for targeted poverty alleviation in a city in China. *Information Technology for Development, 27*(3).
- Novianto, N. (2023). Systematic literature review: Models of digital transformation in the public sector. *Policy & Governance Review, 7*(2), 170-194. https://doi.org/10.30589/pgr.v7i2.753
- OECD. (2021). *The E-Leaders Handbook on the Governance of Digital Government.* OECD Digital Government Studies. OECD Publishing, Paris. https://doi.org/10.1787/ac7f2531-en
- OECD. (2024). 2023 OECD Digital Government Index: Results and key findings. *OECD Public Governance Policy Papers, No. 44.* OECD Publishing, Paris. https://doi.org/10.1787/1a89ed5e-en
- Palos-Sánchez, P. R., Baena-Luna, P., García-Ordaz, M., & Martínez-López, F. J. (2023). Digital transformation and local government response to the COVID-19 pandemic: An assessment of its impact on the sustainable development goals. *SAGE Open, 13*(2).

- Patergiannaki, Z., & Pollalis, Y. (2023). E-government maturity assessment: Evidence from Greek municipalities. *Policy and Internet, 15*(1).
- Pishnyak, A. I., & Khalina, N. V. (2022). Adaptation of the middle class to innovation: Perception of new technologies and openness to them. *Population and Economics, 6*(3).
- Pittaway, J. J., & Montazemi, A. R. (2020). Know-how to lead digital transformation: The case of local governments. *Government Information Quarterly, 37*(4).
- Plesner, U., Justesen, L., & Glerup, C. (2018). The transformation of work in digitized public sector organizations. *Journal of Organizational Change Management, 31*(5).
- Polzer, T., & Goncharenko, G. (2022). The UK COVID-19 app: The failed co-production of a digital public service. *Financial Accountability and Management, 38*(2).
- Pors, A. S. (2015). Becoming digital – Passages to service in the digitized bureaucracy. *Journal of Organizational Ethnography, 4*(2).
- Profiroiu, C. M., Negoiță, C. I., & Costea, A. V. (2024). Digitalization of public administration in EU member states in times of crisis: The contributions of the national recovery and resilience plans. *International Review of Administrative Sciences, 90*(2).
- Restrepo-Carmona, J. A., Zuluaga, J. C., Velásquez, M., Zuluaga, C., Villamil, R. M., Morales, O., Hurtado, Á. M., Escobar, C. A., Sierra-Pérez, J., & Vásquez, R. E. (2024). Smart supervision of public expenditure: A review on data capture, storage, processing, and interoperability with a case study from Colombia. *Information (Switzerland, 15*(10).
- Rowe, F. (2020). Contact tracing apps and values dilemmas: A privacy paradox in a neo-liberal world. *International Journal of Information Management, 55.*
- Saleh, R. A., Haizan Nor, R. N., Islam, M. T., Jusoh, Y. Y., Abdullah, S., Mooduto, H. A., & Dahlan, A. A. (2024). Citizen adoption of e-government services: A systematic literature review with weight and meta-analysis. *International Journal on Advanced Science, Engineering & Information Technology, 14*(4).
- Savchenko, N., Fedirko, O., Muravytska, H., Fedirko, N., & Nemyrovska, O. (2024). Digital transformations of public administration in the context of the COVID-19 pandemic: EU countries case study. *European Review, 32*(2).
- Schrotter, G., & Hürzeler, C. (2020). The Digital Twin of the City of Zurich for urban planning. *PFG - Journal of Photogrammetry, Remote Sensing and Geoinformation Science, 88*(1).

- Schulz, K. A., Gstrein, O. J., & Zwitter, A. J. (2020). Exploring the governance and implementation of sustainable development initiatives through blockchain technology. *Futures, 122.*
- Scupola, A., & Mergel, I. (2022). Co-production in digital transformation of public administration and public value creation: The case of Denmark. *Government Information Quarterly, 39*(1).
- Senyo, P. K., Effah, J., & Osabutey, E. L. C. (2021). Digital platformisation as public sector transformation strategy: A case of Ghana's paperless port. *Technological Forecasting and Social Change, 162.*
- Sharma, R., Fantin, A.-R., Prabhu, N., Guan, C., & Dattakumar, A. (2016). Digital literacy and knowledge societies: A grounded theory investigation of sustainable development. *Telecommunications Policy, 40*(7).
- Shen, Y., Cheng, Y., & Yu, J. (2023). From recovery resilience to transformative resilience: How digital platforms reshape public service provision during and post COVID-19. *Public Management Review, 25*(4).
- Stender, S., Bulkot, O., Iastremska, O., Saienko, V., & Pereguda, Y. (2024). Digital transformation of the national economy of Ukraine: Challenges and opportunities. *Financial and Credit Activity: Problems of Theory and Practice, 2*(55).
- Storozhenko, L., Olshanskyi, O., Stativka, N., Chernoivanenko, A., & Hordiienko, Y. (2024). Public administration in the context of digital transformation: Innovations and challenges. *Revista de Cercetare si Interventie Sociala, 85.*
- Tangi, L., Janssen, M., Benedetti, M., & Noci, G. (2021). Digital government transformation: A structural equation modelling analysis of driving and impeding factors. *International Journal of Information Management, 60.*
- Tassabehji, R., Hackney, R., & Popovič, A. (2016). Emergent digital era governance: Enacting the role of the 'institutional entrepreneur' in transformational change. *Government Information Quarterly, 33*(2).
- Thanh, T. T., Ha, L. T., Dung, H. P., & Huong, T. T. L. (2023). Impacts of digitalization on energy security: Evidence from European countries. *Environment, Development and Sustainability, 25*(10).
- Tolbert, C. J., & Mossberger, K. (2006). The effects of e-government on trust and confidence in government. *Public Administration Review, 66*(3), 354–369. https://doi.org/10.1111/j.1540-6210.2006.00594.x
- Torfing, J., Ferlie, E., Jukić, T., & Ongaro, E. (2021). A theoretical framework for studying the co-creation of innovative solutions and public value. *Policy and Politics, 49*(2).

- United Nations (2020), *E-Government Survey 2020*, Retrieved from https://publicadministration.un.org/en/Research/UN-e-Government-Surveys.
- United Nations (2022), *E-Government Development Index 2022*, Retrieved from https://publicadministration.un.org/en/Research/UN-e-Government-Surveys.
- van Dijck, J. (2020), *Governing digital societies: Private platforms, public values*, *Computer Law and Security Review*, Vol. 36.
- van Noordt, C., & Misuraca, G. (2022), *Exploratory insights on artificial intelligence for government in Europe*, *Social Science Computer Review*, Vol. 40 (2).
- Waller, L., & Genius, A. (2015), *Barriers to transforming government in Jamaica: Challenges to implementing initiatives to enhance the efficiency, effectiveness, and service delivery of government through ICTs (e-Government)*, *Transforming Government: People, Process and Policy*, Vol. 9 (4).
- Watson, R. T., & Webster, J. (2020), *Analyzing the past to prepare for the future: Writing a literature review a roadmap for release 2.0*, *Journal of Decision Systems*, https://doi.org/10.1080/12460125.2020.1798591.
- Webster, J., & Watson, R. T. (2002), *Analyzing the past to prepare for the future: Writing a literature review*, *MIS Quarterly*, Vol. 26 (2), xiii–xxiii.
- Weerakkody, V., Omar, A., El-Haddadeh, R., & Al-Busaidy, M. (2016), *Digitally-enabled service transformation in the public sector: The lure of institutional pressure and strategic response towards change*, *Government Information Quarterly*, Vol. 33 (4).
- Westerman, G., Bonnet, D., & McAfee, A. (2014), *Leading digital: Turning technology into business transformation*, *Harvard Business Press*.
- Xue, Y., Chen, L., Feng, Z., & Huang, Y. (2024), *Breaking the resource curse: Heterogeneous effects of digital government*, *Resources Policy*, Vol. 90.
- Young, M. M. (2020), *Implementation of digital-era governance: The case of open data in U.S. cities*, *Public Administration Review*, Vol. 80 (2).
- Yuan, Y.-P., Dwivedi, Y. K., Tan, G. W.-H., Cham, T.-H., Ooi, K.-B., Aw, E. C.-X., & Currie, W. (2023), *Government digital transformation: Understanding the role of government social media*, *Government Information Quarterly*, Vol. 40 (1).
- Zakiuddin, N. F., Anggara, S. M., & Suhardi. (2024), *Developing digital service transformation maturity model in public sector*, *IEEE Access*, Vol. 12.
- Zekić-Sušac, M., Mitrović, S., & Has, A. (2021), *Machine learning-based system for managing energy efficiency of the public sector as an approach*

towards smart cities, *International Journal of Information Management*, Vol. 58.

- Zwitter, A. J., Gstrein, O. J., & Yap, E. (2020), *Digital identity and the blockchain: Universal identity management and the concept of the "self-sovereign" individual*, *Frontiers in Blockchain*, Vol. 3.
- Zyzak, B., Sienkiewicz-Małyjurek, K., & Jensen, M. R. (2024), *Public value management in digital transformation: A scoping review*, *International Journal of Public Sector Management*, Vol. 37 (7).

APPENDIX. SELECTED REFERENCES

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
1	Mergel I.; Edelmann N.; Haug N. (2019). Defining digital transformation: Results from expert interviews. Government Information Quarterly. Vol. 36 (4).	Empirical	Global		X		X											**2**
2	Androutsopoulou A.; Karacapilidis N.; Loukis E.; Charalabidis Y. (2019). Transforming the communication between citizens and government through AI-guided chatbots. Government Information Quarterly. Vol. 36 (2).	Empirical	Greece										X					**1**
3	AlNuaimi B.K.; Kumar Singh S.; Ren S.; Budhwar P.; Vorobyev D. (2022). Mastering digital transformation: The nexus between leadership, agility, and digital strategy. Journal of Business Research. Vol. 145 ().	Empirical	UAE		X					X								**2**
4	Schrotter G.; Hürzeler C. (2020). The Digital Twin of the City of Zurich for Urban Planning. PFG - Journal of Photogrammetry, Remote Sensing and Geoinformation Science. Vol. 88 (1).	Empirical	Switzerland					X				X						**2**
5	Brunetti F.; Matt D.T.; Bonfanti A.; De Longhi A.; Pedrini G.; Orzes G. (2020). Digital transformation challenges: strategies emerging from a multi-stakeholder approach. TQM Journal. Vol. 32 (4).	Empirical	Italy		X					X								**2**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
6	Zekić-Sušac M.; Mitrović S.; Has A. (2021). Machine learning based system for managing energy efficiency of public sector as an approach towards smart cities. International Journal of Information Management. Vol. 58 ().	Empirical	Croatia									X						**1**
7	Criado J.I.; Gil-Garcia J.R. (2019). Creating public value through smart technologies and strategies: From digital services to artificial intelligence and beyond. International Journal of Public Sector Management. Vol. 32 (5).	Conceptual / Theoretic						X					X					**2**
8	Gong Y.; Yang J.; Shi X. (2020). Towards a comprehensive understanding of digital transformation in government: Analysis of flexibility and enterprise architecture. Government Information Quarterly. Vol. 37 (3).	Conceptual / Theoretic									X							**1**
9	Chatfield A.T.; Reddick C.G. (2019). A framework for Internet of Things-enabled smart government: A case of IoT cybersecurity policies and use cases in U.S. federal government. Government Information Quarterly. Vol. 36 (2).	Empirical	USA						X							X		**2**
10	Agostino D.; Arnaboldi M.; Lema M.D. (2020). New development: COVID-19 as an accelerator of digital transformation in public service delivery. Public Money and Management. Vol. ().	Empirical	Italy			X									X			**2**
11	Rowe F. (2020). Contact tracing apps and values dilemmas: A privacy paradox in a neo-liberal world. International Journal of Information Management. Vol. 55 ().	Empirical	France													X		**1**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
12	Gracias J.S.; Parnell G.S.; Specking E.; Pohl E.A.; Buchanan R. (2023). Smart Cities—A Structured Literature Review. Smart Cities. Vol. 6 (4).	Literature Review										X						**1**
13	Tangi L.; Janssen M.; Benedetti M.; Noci G. (2021). Digital government transformation: A structural equation modelling analysis of driving and impeding factors. International Journal of Information Management. Vol. 60 ().	Empirical	Italy								X							**1**
14	Pittaway J.J.; Montazemi A.R. (2020). Know-how to lead digital transformation: The case of local governments. Government Information Quarterly. Vol. 37 (4).	Empirical	Canada								X							**1**
15	Alvarenga A.; Matos F.; Godina R.; Matias J.C.O. (2020). Digital transformation and knowledge management in the public sector. Sustainability (Switzerland). Vol. 12 (14).	Empirical	Portugal		X				X		X							**3**
16	Gabryelczyk R. (2020). Has COVID-19 Accelerated Digital Transformation? Initial Lessons Learned for Public Administrations. Information Systems Management. Vol. 37 (4).	Conceptual / Theoretic				X	X				X							**3**
17	Abdeldayem M.M.; Aldulaimi S.H. (2020). Trends and opportunities of artificial intelligence in human resource management: Aspirations for public sector in Bahrain. International Journal of Scientific and Technology Research. Vol. 9 (1).	Conceptual / Theoretic	Bahrain								X							**1**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
18	Scupola A.; Mergel I. (2022). Co-production in digital transformation of public administration and public value creation: The case of Denmark. Government Information Quarterly. Vol. 39 (1).	Empirical	Denmark						X									**1**
19	van Dijck J. (2020). Governing digital societies: Private platforms, public values. Computer Law and Security Review. Vol. 36 ().	Conceptual / Theoretic						X									X	**2**
20	Ahn M.J.; Chen Y.-C. (2022). Digital transformation toward AI-augmented public administration: The perception of government employees and the willingness to use AI in government. Government Information Quarterly. Vol. 39 (2).	Empirical	USA								X							**1**
21	Castro C.; Lopes C. (2022). Digital Government and Sustainable Development. Journal of the Knowledge Economy. Vol. 13 (2).	Empirical	Global	X				X										**2**
22	Hansson K.; Belkacem K.; Ekenberg L. (2015). Open Government and Democracy: A Research Review. Social Science Computer Review. Vol. 33 (5).	Literature Review		X				X	X									**3**
23	Al-Rwaidan R.M.; Aldossary N.; Eldahamsheh M.M.; Al-Azzam M.K.A.; Al-Quran A.Z.; Al-Hawary S.I.S. (2023). The impact of cloud-based solutions on digital transformation of HR practices. International Journal of Data and Network Science. Vol. 7 (1).	Empirical	Jordan		X						X							**2**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
24	Clarke A. (2020). Digital government units: what are they, and what do they mean for digital era public management renewal?. International Public Management Journal. Vol. 23 (3).	Empirical	Canada		X		X		X									**3**
25	Torfing J.; Ferlie E.; Jukić T.; Ongaro E. (2021). A theoretical framework for studying the co-creation of innovative solutions and public value. Policy and Politics. Vol. 49 (2).	Conceptual / Theoretic					X			X								**2**
26	Plesner U.; Justesen L.; Glerup C. (2018). The transformation of work in digitized public sector organizations. Journal of Organizational Change Management. Vol. 31 (5).	Literature Review					X				X							**2**
27	Sharma R.; Fantin A.-R.; Prabhu N.; Guan C.; Dattakumar A. (2016). Digital literacy and knowledge societies: A grounded theory investigation of sustainable development. Telecommunications Policy. Vol. 40 (7).	Empirical	Global											X				**1**
28	Senyo P.K.; Effah J.; Osabutey E.L.C. (2021). Digital platformisation as public sector transformation strategy: A case of Ghana's paperless port. Technological Forecasting and Social Change. Vol. 162 ().	Empirical	Africa		X								X					**2**
29	Hong Nham N.T.; Ha L.T. (2022). Making the circular economy digital or the digital economy circular? Empirical evidence from the European region. Technology in Society. Vol. 70 ().	Empirical	EU						X				X					**2**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
30	Barrutia J.M.; Echebarria C. (2021). Effect of the COVID-19 pandemic on public managers' attitudes toward digital transformation. Technology in Society. Vol. 67 ().	Empirical	Spain			X	X			X								**3**
31	Tassabehji R.; Hackney R.; Popovič A. (2016). Emergent digital era governance: Enacting the role of the 'institutional entrepreneur' in transformational change. Government Information Quarterly. Vol. 33 (2).	Empirical	USA	X			X			X								**3**
32	van Noordt C.; Misuraca G. (2022). Exploratory Insights on Artificial Intelligence for Government in Europe. Social Science Computer Review. Vol. 40 (2).	Empirical	EU					X										**1**
33	Goh J.M.; Arenas A.E. (2020). IT value creation in public sector: how IT-enabled capabilities mitigate tradeoffs in public organisations. European Journal of Information Systems. Vol. 29 (1).	Empirical	EU				X						X					**2**
34	Weerakkody V.; Omar A.; El-Haddadeh R.; Al-Busaidy M. (2016). Digitally-enabled service transformation in the public sector: The lure of institutional pressure and strategic response towards change. Government Information Quarterly. Vol. 33 (4).	Empirical	Oman								X							**1**
35	Schulz K.A.; Gstrein O.J.; Zwitter A.J. (2020). Exploring the governance and implementation of sustainable development initiatives through blockchain technology. Futures. Vol. 122 ().	Empirical	Global						X							X		**2**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
36	Kim S.; Andersen K.N.; Lee J. (2022). Platform Government in the Era of Smart Technology. Public Administration Review. Vol. 82 (2).	Conceptual / Theoretic		X			X			X							X	**4**
37	Kotsev A.; Minghini M.; Tomas R.; Cetl V.; Lutz M. (2020). From spatial data infrastructures to data spaces—A technological perspective on the evolution of European SDIs. ISPRS International Journal of Geo-Information. Vol. 9 (3).	Conceptual / Theoretic	EU		X													**1**
38	Yuan Y.-P.; Dwivedi Y.K.; Tan G.W.-H.; Cham T.-H.; Ooi K.-B.; Aw E.C.-X.; Currie W. (2023). Government Digital Transformation: Understanding the Role of Government Social Media. Government Information Quarterly. Vol. 40 (1).	Empirical	China						X							X		**2**
39	Shen Y.; Cheng Y.; Yu J. (2023). From recovery resilience to transformative resilience: How digital platforms reshape public service provision during and post COVID-19. Public Management Review. Vol. 25 (4).	Empirical	China			X				X								**2**
40	Andersson C.; Hallin A.; Ivory C. (2022). Unpacking the digitalisation of public services: Configuring work during automation in local government. Government Information Quarterly. Vol. 39 (1).	Empirical	Sweden				X				X							**2**
41	Klochan V.; Piliaiev I.; Sydorenko T.; Khomutenko V.; Solomko A.; Tkachuk A. (2021). Digital platforms as a tool for the transformation of strategic consulting in public administration. Journal of	Conceptual / Theoretic								X			X					**2**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
	Information Technology Management. Vol. 13 ().																	
42	Thanh T.T.; Ha L.T.; Dung H.P.; Huong T.T.L. (2023). Impacts of digitalization on energy security: evidence from European countries. Environment, Development and Sustainability. Vol. 25 (10).	Empirical	EU		X													**1**
43	Waller L.; Genius A. (2015). Barriers to transforming government in Jamaica: Challenges to implementing initiatives to enhance the efficiency, effectiveness and service delivery of government through ICTs (e-Government). Transforming Government: People, Process and Policy. Vol. 9 (4).	Empirical	Jamaica		X								X					**2**
44	Pors A.S. (2015). Becoming digital – passages to service in the digitized bureaucracy. Journal of Organizational Ethnography. Vol. 4 (2).	Empirical	Denmark				X							X				**2**
45	Young M.M. (2020). Implementation of Digital-Era Governance: The Case of Open Data in U.S. Cities. Public Administration Review. Vol. 80 (2).	Empirical	USA					X										**1**
46	Hujran O.; Al-Debei M.M.; Al-Adwan A.S.; Alarabiat A.; Altarawneh N. (2023). Examining the antecedents and outcomes of smart government usage: An integrated model. Government Information Quarterly. Vol. 40 (1).	Empirical	UAE	X	X			X	X									**4**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
47	Kuhlmann S.; Heuberger M. (2023). Digital transformation going local: implementation, impacts and constraints from a German perspective. Public Money and Management. Vol. 43 (2).	Empirical	Germany		X			X	X									**3**
48	Zwitter A.J.; Gstrein O.J.; Yap E. (2020). Digital Identity and the Blockchain: Universal Identity Management and the Concept of the "Self-Sovereign" Individual. Frontiers in Blockchain. Vol. 3 ().	Conceptual / Theoretic														X		**1**
49	Polzer T.; Goncharenko G. (2022). The UK COVID-19 app: The failed co-production of a digital public service. Financial Accountability and Management. Vol. 38 (2).	Empirical	UK			X									X	X		**3**
50	Ning X.; Ramirez R.; Khuntia J. (2021). Blockchain-enabled government efficiency and impartiality: using blockchain for targeted poverty alleviation in a city in China. Information Technology for Development. Vol. 27 (3).	Empirical	China					X										**1**
51	Moser-Plautz B.; Schmidthuber L. (2023). Digital government transformation as an organizational response to the COVID-19 pandemic. Government Information Quarterly. Vol. 40 (3).	Empirical	Austria			X												**1**
52	Lee C.; Lee J.M.; Liu Y. (2023). Catalysing innovation and digital transformation in combating the Covid-19 pandemic: Whole-of government collaborations in ICT, R&D, and business digitization in Singapore. Public Money and Management. Vol. 43 (4).	Empirical	Singapore												X			**1**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
53	Xue Y.; Chen L.; Feng Z.; Huang Y. (2024). Breaking the resource curse: Heterogeneous effects of digital government. Resources Policy. Vol. 90 ().	Empirical	Global											X				**1**
54	Palos-Sánchez P.R.; Baena-Luna P.; García-Ordaz M.; Martínez-López F.J. (2023). Digital Transformation and Local Government Response to the COVID-19 Pandemic: An Assessment of Its Impact on the Sustainable Development Goals. SAGE Open. Vol. 13 (2).	Empirical	Spain			X										X		**2**
55	Nielsen J.A.; Elmholdt K.T.; Noesgaard M.S. (2024). Leading digital transformation: A narrative perspective. Public Administration Review. Vol. 84 (4).	Empirical	Denmark				X			X	X							**3**
56	Patergiannaki Z.; Pollalis Y. (2023). E-Government maturity assessment: Evidence from Greek municipalities. Policy and Internet. Vol. 15 (1).	Empirical	Greece		X				X									**2**
57	Profiroiu C.M.; Negoiță C.I.; Costea A.V. (2024). Digitalization of public administration in EU member states in times of crisis: the contributions of the national recovery and resilience plans. International Review of Administrative Sciences. Vol. 90 (2).	Empirical	EU		X				X				X					**3**
58	Atobishi T.; Moh'd Abu Bakir S.; Nosratabadi S. (2024). How Do Digital Capabilities Affect Organizational Performance in the Public Sector? The Mediating Role of the Organizational Agility. Administrative Sciences. Vol. 14 (2).	Empirical	Jordan		X						X							**2**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
59	Boustani N.M.; Xu Q.; Xu Y. (2022). Getting Smarter: Blockchain and IOT Mixture in China Smart Public Services. Smart Cities. Vol. 5 (4).	Empirical	China									X				X		**2**
60	Assefa S.; Rorissa A.; Alemneh D. (2021). Digital Readiness Assessment of Countries in Africa: A Case Study Research. Proceedings of the Association for Information Science and Technology. Vol. 58 (1).	Empirical	Africa		X									X				**2**
61	Stender S.; Bulkot O.; Iastremska O.; Saienko V.; Pereguda Y. (2024). DIGITAL TRANSFORMATION OF THE NATIONAL ECONOMY OF UKRAINE: CHALLENGES AND OPPORTUNITIES. Financial and Credit Activity: Problems of Theory and Practice. Vol. 2 (55).	Empirical	Ukraine		X				X									**2**
62	Savchenko N.; Fedirko O.; Muravytska H.; Fedirko N.; Nemyrovska O. (2024). Digital Transformations of Public Administration in the Context of the COVID-19 Pandemic: EU Countries Case Study. European Review. Vol. 32 (2).	Empirical	EU										X					**1**
63	Irimie R.C. (2015). E government: Transforming government engagement in the european union. Mediterranean Journal of Social Sciences. Vol. 6 (2S2).	Conceptual / Theoretic	EU					X					X					**2**
64	Kenosi C.; Zlotnikova I.; Sigwele T. (2024). Industrial Revolution 4.0 technologies for democratic e-government services: A systematic review of transformational frameworks. eJournal of eDemocracy and Open Government. Vol. 16 (3 Special Issue).	Literature Review											X				X	**2**

				DIGITAL TRANSFORMATION (Core Concept)			PUBLIC MANAGEMENT & GOVERNANCE			ORGANIZATIONAL CHANGE & INNOVATION		CITIZEN-CENTRIC SERVICES & ENGAGEMENT				ETHICAL, LEGAL & SECURITY CONCERNS		
NR	**Article**	**Type**	**Country / Region**	Definition and scope in public sector	Key Drivers and Challenges in Public Administration	COVID-19 as a Catalyst for Digital Transformation in the Public Sector	Digital Era Governance (DEG)	Open government and transparency	Policy-making in the digital age	Digital leadership and culture	Change management in bureaucratic structures	Smart cities and IoT applications	Digital platforms and citizen engagement	Digital inclusion and accessibility	Public-private partnerships in digital services	Data privacy and cybersecurity	Legal frameworks for digital governance	**Count**
65	Fitsilis F.; Papastylianou A. (2024). Training of Greek Public Administrators in Legal Knowledge Management by Using the Legislation Editing Open Software (LEOS). Journal of the Knowledge Economy. Vol. 15 (2).	Empirical	Greece								X							**1**
66	Gritt E.; Forsgren E.; Pandza K. (2024). Liminal digital transformation in public sector: The case of UK policing. Journal of Strategic Information Systems. Vol. 33 (3).	Empirical	UK						X									**1**
67	Storozhenko L.; Olshanskyi O.; Stativka N.; Chernoivanenko A.; Hordiienko Y. (2024). Public Administration in the Context of Digital Transformation: Innovations and Challenges. Revista de Cercetare si Interventie Sociala. Vol. 85 ().	Conceptual / Theoretic			X		X		X									**3**
68	Karampotsis E.; Aspridis G.M.; Dounias G.; Exarchou V. (2024). Critical success factors and key performance indicators in the modernization of public services: empirical evidence from Greece. International Review of Public Administration. Vol. 29 (4).	Empirical	Greece						X		X							**2**
69	Pishnyak A.I.; Khalina N.V. (2022). Adaptation of the middle class to innovation: perception of new technologies and openness to them. Population and Economics. Vol. 6 (3).	Empirical	Greece											X				**1**
Count				**5**	**18**	**7**	**13**	**11**	**16**	**9**	**15**	**4**	**11**	**5**	**3**	**8**	**3**	