administrative sciences

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Assessing Digital Governance Maturity in the Context of Municipal Resilience: The Triadic Model, Its Dimensions and Interrelations

Rita Toleikienė [1,*], Mindaugas Butkus [1], Ilona Bartuševičienė [1] and Vita Jukневičienė [2,*]

[1] Faculty of Public Governance and Business, Mykolas Romeris University, 08303 Vilnius, Lithuania; mindaugas.butkus@mruni.eu (M.B.); ilona.bartuseviciene@mruni.eu (I.B.)
[2] Šiauliai Academy, Vilnius University, 76352 Šiauliai, Lithuania
* Correspondence: rita.toleikiene@mruni.eu (R.T.); v.jukneviciene@gmail.com (V.J.)

Abstract

Different Digital Governance maturity models are established; however, limited research has examined their applicability at the local government level, particularly concerning the interrelations among dimensions such as Strategy, Employees, and Processes. Understanding these connections is vital for municipalities striving to enhance resilience through Digital Governance amidst uncertainties. This study aims to develop, justify, and empirically test a Triadic Model capturing the relationships among its dimensions, assessing Digital Governance maturity in local governments during crisis response. To achieve this, a quantitative survey was conducted across all 60 Lithuanian municipalities, and the collected data were analyzed using Confirmatory Factor Analysis (CFA) to validate the factor structure and Structural Equation Modeling (SEM) to test the hypothesized relationships among variables and latent constructs. The findings reveal significant interrelations among the model's dimensions in enhancing municipal resilience. Research proposes a comprehensive framework for assessing Digital Governance maturity at three levels—Digital Consistency, Digital Adaptation, and Digital Transformation—and examines their interactive influence during crises. The results highlight how the dimensions of the Triadic Model collectively reflect municipal responses, emphasizing the importance of an integrated, staged approach to digitalization. This validated framework advances understanding of Digital Governance in local authorities and underscores the relevance of interrelated key dimensions for fostering resilience in uncertain contexts. In addition to model validation, the study also explores practical variations in Digital Governance maturity among Lithuanian municipalities, demonstrating the model's applicability as a diagnostic tool for local governments.

Keywords: digital governance; digital maturity; Triadic Model; local government; municipal resilience; Lithuania

Received: 9 September 2025
Revised: 14 October 2025
Accepted: 28 October 2025
Published: 7 November 2025

Citation: Toleikienė, R., Butkus, M., Bartuševičienė, I., & Jukневičienė, V. (2025). Assessing Digital Governance Maturity in the Context of Municipal Resilience: The Triadic Model, Its Dimensions and Interrelations. *Administrative Sciences*, *15*(11), 435. https://doi.org/10.3390/admsci15110435

1. Introduction

Local governments constantly face uncertainties and disruptions, increasing the need to strengthen resilience. Recent studies (Park & Choi, 2023; Horák & Špaček, 2024) identify digital governance as a key factor for it. During crises like COVID-19, municipalities aim to improve responses and adaptation through advanced digital solutions, managing pandemic challenges, maintaining services, and sustaining public trust (Spicer et al., 2023;

Nolte & Lindenmeier, 2024; Ansell & Torfing, 2025). Integrating information and communication technologies into public administration—crucial for efficiency, transparency, and citizen engagement—enables local governments to deliver accessible online services and foster participation (Sigurjonsson et al., 2024; Bernhard et al., 2018). The transition from "Digital Government" to "Digital Governance" marks a shift from a primarily technical structure to a set of interrelated processes operating across multiple levels (Erkut, 2020), reflecting a broader evolution toward multi-stakeholder interactions among government, the private sector, and civil society (Gil-Garcia et al., 2018; Barcevičius et al., 2019; Debeljak & Dečman, 2022; Esposito et al., 2024), thereby enhancing their collective ability to meet community needs, foster digital skills, and promote transparency and innovation. For instance, municipal open-data initiatives, e-participation tools, and smart-community platforms exemplify this transition by transforming digital government from a service-delivery mechanism into a governance ecosystem in which local authorities, private actors, and citizens collaboratively design and implement digital solutions.

Many studies have examined digital maturity and its supporting factors in public sector organizations and local governments, focusing on conceptualizing maturity models (Teichert, 2019; Kafel et al., 2021; Nerima & Ralyté, 2021; Aras & Büyüközkan, 2023; Thordsen & Bick, 2023), organizational factors (Tangi et al., 2022; Kaszás et al., 2023; David et al., 2023), e-government maturity (Khademi & Khademi, 2022; Hujran et al., 2023; Patergiannaki & Pollalis, 2023), and citizen-oriented models (Panayiotou & Stavrou, 2019; Zakiuddin et al., 2024; Waara, 2025). However, the scientific problem addressed in this study lies in the limited understanding of Digital Governance maturity levels and the challenges of assessing model dimensions (Strategy-Employees-Processes), their interrelations and interactions in the context of municipal resilience. This highlights the need for a comprehensive and empirically validated framework for assessing Digital Governance maturity in local governments, supporting their digital transformation and resilience amidst uncertainties. Thus, this research aims to develop, justify, and empirically validate the Triadic Model that captures the interrelations among its dimensions and maturity levels, providing a structured tool for assessing Digital Governance maturity in local governments, particularly in the context of crisis response. The framework was empirically validated through survey items that explicitly emphasized municipal practices in crisis and uncertainty contexts, ensuring that the model captures how Digital Governance maturity supports resilience under such conditions.

Despite increasing attention to digital maturity in the public sector, limited research has addressed how different dimensions of Digital Governance interact to shape municipal resilience, particularly at the local level. Existing models often focus on technological or service-delivery aspects, overlooking the integrated roles of strategic direction, employee competencies, and process management in fostering resilience. This study addresses this gap by proposing and empirically validating the crisis-oriented Triadic Model that captures these interrelations across distinct maturity levels of municipalities. This study combines theoretical model development with empirical analysis of Lithuanian municipalities to illustrate how Digital Governance maturity manifests in practice.

Empirical data for testing the proposed model were collected from Lithuania, a leader in e-government development. Lithuania ranked 21st in the 2024 UN E-Government Development Survey among 193 countries, reflecting high e-government capabilities (Lithuania Co-create, 2024) and 14th in the OECD Digital Government Index, above the OECD average (OECD, 2024). Despite these achievements, Lithuania faces challenges such as weak interoperability between systems and outdated data management practices (Koutsogeorgopoulou, 2023). Other obstacles include a young democracy and a large elderly population with restricted ICT literacy (Dvorak et al., 2020). These issues underscore Lithuania's strong

commitment to Digital Governance and provide a valuable empirical setting for testing the proposed Triadic Model, offering insights that may be relevant for other small, digitally advanced countries pursuing resilient governance.

Empirical data were collected via a survey of all 60 Lithuanian municipalities, gathering local government representatives' assessments of the current state of Digital Governance within their municipalities. The survey included questions about the status of municipal digital maturity specifically in the context of crisis response, such as COVID-19, requiring respondents to evaluate their municipal digital governance in terms of preparedness to respond to crises. To validate the proposed Triadic Model and test its hypotheses, the study employed Confirmatory Factor Analysis (CFA) to verify the factor structure of the model's dimensions and Structural Equation Modelling (SEM) to examine the relationships between observed variables and latent constructs (Brown, 2015; Tangi et al., 2021; Statistics Solutions, 2025a, 2025b). These techniques are particularly suitable for this research because they allow for the simultaneous assessment of measurement validity and structural relationships among latent constructs, ensuring that theoretical dimensions such as Strategy, Employees, and Processes are empirically justified and interlinked within a unified analytical framework. Such a combination of CFA and SEM is well-established in social science and public administration research for testing multidimensional models (De Carvalho & Chima, 2014; Davis & Stazyk, 2017). These analytical methods were therefore central to empirically confirming the interrelations among Strategy, Employees, and Processes and assessing their contribution to municipal resilience across different maturity levels. Results indicate that Digital Governance depends on the maturity level of dimensions like strategic decisions, employee competencies, and processes.

The main contributions and novelty of this research lie in its development and empirical validation of a Triadic Model for assessing Digital Governance maturity in local governments. The study conceptualizes three interrelated dimensions—Strategy, Employees, and Processes—across three maturity levels (Consistency, Adaptation, and Transformation), offering a structured approach to capture the progression of digital governance capabilities. Methodologically, it applies Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM) to simultaneously validate the measurement structure and test the interrelations among these dimensions, providing an integrated analytical approach that is rarely applied at the municipal level. By linking Digital Governance maturity to municipal resilience in crisis contexts, the research advances both theoretical understanding and practical insights into how local governments can strengthen their adaptive and transformative capacities through digitalization.

The paper is structured as follows: Section 2 presents the conceptual model for assessing Digital Governance maturity in municipalities, detailing maturity levels and dimensions. Section 3 defines the attributes of an assessment instrument, reflecting differences across maturity levels. Section 4 examines interrelations among the dimensions, highlighting transitions between maturity levels with insights from Lithuanian municipalities. The final chapters conclude, discuss future research directions and indicate research limitations.

2. Theoretical Background

2.1. Local Governments' Digital Governance Maturity in the Context of Municipal Resilience

The digitalization of local public administration, through integrating digital technologies into governance, improves organizational adaptability and public service delivery, thereby strengthening municipal resilience in the face of crises (Lee-Geiller & Lee, 2022; Idzi & Gomes, 2022). It enhances efficiency and multichannel stakeholder participation (Vitálišová et al., 2023). Evolving from a technological tool, Digital Governance now shapes organizational culture and strategy, fostering innovation that is essential for resilience

(Grigalashvili, 2023; Millard, 2023; Xu & Dai, 2024). Effective digital governance plays a pivotal role in transforming society through digitalization, which is integral to building resilience (Fekete et al., 2025). Leaders must evaluate how technology influences all activities to ensure alignment with governance principles and public engagement, especially during crises where organizational change is vital for resilience (Plimakis, 2023). Success depends on considering social, organizational, and political factors like cultural attitudes and power dynamics (Tubis, 2023; David et al., 2023; Vigoda-Gadot & Mizrahi, 2024). Effective implementation requires understanding socio-economic contexts, aligning with organizational goals (Aristovnik et al., 2024), and fostering a culture of innovation through capacity-building. As Carlsson et al. (2023) highlight, municipalities with higher digital literacy not only enhance their organizational (municipal) resilience but also empower communities, enabling citizens to navigate crises more effectively. However, barriers such as personnel shortages, limited technical skills, resources, legal constraints, and diverse administrative cultures pose challenges that must be addressed for digital governance to effectively support resilient local governance systems (Jans et al., 2016; Adnan et al., 2021; Adade & de Vries, 2025).

Research on Digital Governance often concentrates on specific areas like e-governance, e-services and e-leadership (Manoharan et al., 2023; Kusto & Klepacki, 2022; Rybnikova et al., 2022). However, a holistic approach includes digital infrastructure, competencies, data management, and cyber resilience, all of which are essential for effective crisis response and navigating uncertainties (Viana, 2021; Hoffmann & Solarte-Vasquez, 2022; Debeljak & Dečman, 2022; Kitsios et al., 2023). Digital transformation has become a critical necessity for governments aiming to respond to crises and uncertainties effectively, reinforcing the importance of municipal resilience (Eom & Lee, 2022; Gangneux & Joss, 2022; Carlsson et al., 2023; Clement et al., 2023; Bhatia & Bhatia, 2025). Achieving sustainable digital advancement, relying on balanced development and integration of ICTs increases the pressure for municipalities to digitize their operations to advance their digital maturity and to strengthen municipal resilience in the context of crisis (Lekkas & Souitaris, 2023; He et al., 2023; Horák & Špaček, 2024). Digital Governance in local governments seek digital maturity as it refers to the capability of these entities to effectively leverage digital technologies in enhancing their operations, service delivery, and citizen engagement. Local government capacities such as human potential (knowledge, skills, competencies, ethics), resources (finances, infrastructure, ICTs), procedures, structures, decision-making process, legal frameworks, supporting policies, citizen needs and trends in the public sector (Wu et al., 2017; Choi, 2021) play an important role in the development of digital maturity that supports resilience.

Digital Governance aimed at digital maturity involves frameworks and strategies for the systematic adoption of digital tools (HosseiniNasab, 2024). Digital maturity reflects an organization's capacity to manage technologies aligned with strategic goals, improving performance and responsiveness (He et al., 2023). A mature organization monitors performance and encourages continual evolution (Aras & Büyüközkan, 2023). It follows a standard path to digital transformation (Kaszás et al., 2023), emphasizing transparency, stakeholder engagement, public value, digital competencies, process digitalization, ICT adoption, and e-innovativeness (Kafel et al., 2021). Development begins with a digital strategy and requires ongoing adaptation to environmental changes, shaping the unique digital maturity profile of public sector organizations (Thordsen & Bick, 2023).

Digital maturity in local governments features a shift from centralized control to empowered, cross-functional teams, fostering innovation (HosseiniNasab, 2024). Leadership in maturity evolves from directive to coaching styles, promoting collaboration and knowledge sharing crucial for effective crisis response. In the context of local govern-

ments, features of digital maturity include collaborative governance, organizational agility, political and managerial support, and a culture of continuous improvement (Teichert, 2019; Tangi et al., 2022). Mature Digital Governance depends on effective information integration, a supportive digital culture, and sufficient resources. It involves developing forward-looking policies that optimize digital technologies, strengthen agility, and sustain ongoing digital transformation, fostering transparency, engagement, innovation through advanced practices and responsiveness in times of crisis and uncertainty.

In summary, Digital Governance maturity represents a transformative shift for local governments, leveraging digital technologies to boost citizen engagement, enhance service delivery, and elevate governance standards. Consequently, the model for assessing Digital Governance maturity in local governments must integrate both the distinct features of the local level and the core governance processes to effectively respond to crisis and uncertainties.

2.2. Conceptualization of the Model, Assessing Digital Governance Maturity in Local Governments

Previous studies have developed digital maturity models across various fields, noting that models should be tailored to their measurement scope, including novelty, audience, goals, application, and respondents (Mettler & Ballester, 2021; Zakiuddin et al., 2024). Models from the private sector may not fully suit the public sector, which focuses on trust and public value rather than profit (Scupola & Mergel, 2021; Hartanto et al., 2021; Zakiuddin et al., 2024; Zhu et al., 2025). Digital maturity assessment evaluates an organization's capabilities and progress in implementing digital technologies to transform operations and stay competitive (Aras & Büyüközkan, 2023). It measures achieved progress, defines success, and guides future adaptation in a digital environment (Kaszás et al., 2023). The assessment model determines the current state in the maturation process (Sprengel & Sven, 2024).

Since the first digital maturity model (DMM) in 2011, interest among managers and scholars has grown (Thordsen & Bick, 2023). Since 2013, numerous models have been developed, including digital government (Eggers & Bellman, 2015; Nerima & Ralyté, 2021; Hujran et al., 2023; HosseiniNasab, 2024; Aristovnik et al., 2024), e-government (Joshi & Islam, 2018; Khademi & Khademi, 2022; Patergiannaki & Pollalis, 2023; Bhatia & Bhatia, 2025), digital services transformation (Zakiuddin et al., 2024), and local government web services (Panayiotou & Stavrou, 2019). However, none explicitly addresses Digital Governance or the unique features of local governments in digitalization and resilience to uncertainties. All models include specific assessment dimensions.

Digital Governance maturity is assessed by determining its capabilities (dimensions) and the current state level (Aras & Büyüközkan, 2023). Key process areas (dimensions) typically include technology, organization, strategy, customer, people, process, etc. (Aras & Büyüközkan, 2023; Tubis, 2023; Lnenicka et al., 2024; Vrbek & Jukić, 2025). These can be grouped into two categories: technology (technologies, data, information systems, infrastructure) and enablers (strategy, culture, leadership, processes, HR, structures) (Tubis, 2023). Previous government and public organization studies show similar dimensions (see Appendix A Table A1).

For local governments, data and technology are central to maintaining performance amidst uncertainties, requiring balance with organizational goals, structures, and resources (Khoshroo & Talari, 2023). Therefore, a well-defined strategy is crucial to ensure resilience, minimize recovery time, and quickly overcome performance impacts during crises (Nkomo & Kalisz, 2023). Digital transformation involves reskilling staff, cultural shifts, ICT-government integration, and measuring digital value; success depends on both technology and strategic process changes (De la Boutetière et al., 2018). Based on these insights,

the proposed Triadic Model includes three main dimensions: Strategy (Eggers & Bellman, 2015; Nerima & Ralyté, 2021; HosseiniNasab, 2024), Employees (Eggers & Bellman, 2015; Kafel et al., 2021; Hujran et al., 2023; Nkomo & Kalisz, 2023; Aristovnik et al., 2024; Vrbek & Jukić, 2025), and Processes (Nerima & Ralyté, 2021; Kafel et al., 2021; Hujran et al., 2023; Nkomo & Kalisz, 2023; Aristovnik et al., 2024; Zakiuddin et al., 2024; Vrbek & Jukić, 2025). These dimensions are explained in detail:

- A *strategy* in local governments involving digitalization establishes a clear roadmap for implementing changes as well as allocating financial resources for transformation processes, effective communication methods, and employee preparation for digitization, enhancing their capacity to respond effectively to crises and uncertainties (Tubis, 2023; Nkomo & Kalisz, 2023). Success relies on leadership commitment and managing risks to avoid strategic drift when adopting new technologies (Eom & Lee, 2022).
- *Employees'* awareness, skills, motivation, continuous learning and participation are crucial for Digital Governance (Tubis, 2023; Haryanti et al., 2023). This dimension integrates both employee capacity—reflecting individual competencies, values, and adaptability—and strategic leadership, which connects human capital to organizational vision and strategic priorities. Attitudes toward digitization affect progress, while organizational (municipal) resilience emphasizes the need to develop employees' competencies and foster collaboration (Pittaway & Montazemi, 2020; Aristovnik et al., 2024; Ahsan & Tahir, 2025).
- *Processes* involve procedures to achieve outcomes, focusing on digitalization, automation, and optimization (David et al., 2023; Tubis, 2023). They include performance and process management, where ICT integration enhances efficiency both internally and externally—facilitating functions like resource planning and information sharing across departments (Haryanti et al., 2023). Importantly, adaptable and agile processes—supported by ICTs—strengthen organizational resilience by enabling quick responses to crises and environmental changes (Nkomo & Kalisz, 2023).

This focus is justified because strategy (strategic alignment and supporting policies) guides digitalization goals, while employees (responsible for implementation) and their skills, leadership, and culture are crucial for building resilience during crises. Processes encompassing planning, organization, management, and monitoring ensure effective service delivery through digitalization, particularly in enhancing organizational ability for a crisis response (Bell, 2019; He et al., 2023).

2.3. Interrelations of Dimensions of the Model, Assessing Digital Governance Maturity in Local Governments

Emphasizing the importance of understanding the interrelationships among the dimensions of Digital Governance maturity in local governments amidst uncertainties, Hypothesis H1 was formulated to examine how Strategy, Employees, and Processes are interconnected at all levels of digital maturity, whether improvements in one dimension would reinforce others, thereby facilitating overall digital progression.

H1. *All three dimensions of digital governance—Strategy, Employees, and Processes—are endogenously and positively interrelated at every maturity level.*

Furthermore, previous research emphasizes that strategies must support the attainment of digital maturity levels and ensure the alignment of ICT with organizational objectives, thus influencing staff development and transformation processes (Haryanti et al., 2023; Tubis, 2023). Consequently, Strategy is hypothesized to act as an exogenous driver that positively impacts both Employees' capabilities and organizational Processes, thereby

enabling organizational advancement towards higher levels of digital maturity. This perspective underscores the critical role of strategic initiatives in fostering organizational skills and establishing effective operational procedures, both of which are essential components of successful digital transformation in the context of uncertainties.

H2. *Strategy, as an exogenous driver of digital governance at all maturity levels, positively influences Employees and their capabilities, which subsequently lead to more effective Processes for organizational success.*

Previous studies suggest various maturity typologies. Eggers and Bellman (2015) suggested assessing early, developing and mature organizations. Kafel et al. (2021) suggested seven degrees of digital maturity. Tubis (2023) provided five stages. Since the pandemic, local governments have advanced beyond the initial stage, adopting ICTs more rapidly (Rybnikova et al., 2022). Some researchers analyze stages from basic tool use to digital leadership and transformation (Vial, 2021; Kraus et al., 2021; He et al., 2023; Susilowati et al., 2025). These reflect organizational progress from minimal commitment to innovation. Digital transformation is increasingly seen as a radical change driven by digital technologies rather than incremental ICT projects (Mergel, 2016; Eom & Lee, 2022; Nielsen et al., 2024). This study adopts this perspective, proposing three types (levels) of digital maturity to reflect the current state of local government's Digital Governance in the face of uncertainties and crises:

- *Digital Consistency* represents the lowest level of digital maturity in local governments, focusing on minimal compliance with legal digitalization mandates without efforts to innovate or modernize; it emphasizes maintaining the current state and reverting to it during crises, supporting basic operational stability amid uncertainties.
- *Digital Adaptation* involves proactively embracing and applying digital technologies, learning from progress of digitalization, and integrating experience into daily operations, thereby improving service quality and efficiency of local government in the context of crises.
- *Digital Transformation* reflects the highest maturity level, with local governments not only adopting but also leading digital initiatives, restructuring strategies, and creating innovative systems to transform internal and organizational activities, strengthening their capacity to respond effectively to crises and uncertainties (Vial, 2021; Kraus et al., 2021; He et al., 2023; Tubis, 2023; Yu et al., 2024).

These types of Digital Governance maturity illustrate the progression of local governments from minimal commitment to leadership and innovation. However, given their diverse legal, socioeconomic, and technological contexts, it is essential to understand these specifics and assess the corresponding digital maturity level to identify the established digital governance type as well as to identify the state of the development of organizational capabilities (dimensions).

Building on this conceptualization, it is hypothesized that the development of Digital Governance at advanced maturity levels occurs in a sequential manner, whereby the foundational phases of Digital Consistency and Digital Adaptation must be established prior to reaching full Digital Transformation. This staged progression implies that each maturity level depends on the successful realization of the preceding phase, thereby shaping the organizational pathways toward higher levels of digital maturity.

H3. *Developing Digital Governance at a higher maturity level requires establishing foundational phases—namely Digital Consistency and then Digital Adaptation—before progressing to full Digital Transformation.*

Building upon this comprehensive framework, the Triadic Model assesses the Digital Governance maturity through three core dimensions—Strategy, Employees, and Processes—aligned with the three maturity levels: Consistency, Adaptation, and Transformation. This conceptualization emphasizes the interconnected and sequential nature of organizational digitalization in the context of municipal resilience.

3. Materials and Methods

3.1. Data Collection

A quantitative study was conducted across all 60 Lithuanian municipalities to empirically test the municipal resilience and digital governance maturity in local governments. The target sample included at least three representatives per municipality, specifically mayors, deputy mayors, administrative directors or delegated officials, and opposition leaders or members. The survey was conducted from March to September 2024. In total, 204 respondents participated, representing all municipalities. This article represents just a part of results of this research, focusing on the Digital Governance maturity issues.

Data was collected via a written survey, capturing respondents' assessments of their organizations' Digital Governance maturity specifically in the context of crisis management and uncertainty. The questionnaire was accessible online (see the Supplementary Material). Participants were asked to evaluate how their municipalities applied digital solutions in preparing for, responding to, and recovering from crises such as COVID-19. We used a ten-point Likert scale, where 1 point means that the respondent completely disagrees with the statement, and 10 points means that the respondent completely agrees with the statement. The survey was emailed to targets with an interactive link. Follow-up calls encouraged participation. Hosted on the Mykolas Romeris University (hereinafter—MRU) server through MS Forms, the survey was accessible only via a direct link.

Participants had to read and accept the Informed Consent (see the Supplementary Material) before starting the survey. The assurance of confidentiality was provided for participants. The collected data were stored securely in MRU's server. Results were aggregated to protect individual identities.

Data collected through MS Forms were exported to Microsoft Excel for preprocessing and organization. Statistical analyses were conducted using AMOS software to perform Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM) for model validation and hypothesis testing. Model diagrams and visual representations of relationships among latent constructs were created using the SEM Diagram Tool (https://semdiag.psychstat.org/ (accessed 9 September 2025)) ensuring clear visualization of the Triadic Model's structural pathways and fit indices.

3.2. The Research Instrument—Validation of the Items of the Triadic Model

The research instrument was a questionnaire, developed through a literature review (He et al., 2023; Youssef & Luthans, 2007; Näswall et al., 2019), focusing on two main issues: municipal resilience and Digital Governance (see the Supplementary Material). The block of Digital Governance questions was designed to operationalise the Triadic Model of Digital Governance maturity in local governments. It consisted of 27 items grouped into three maturity levels (Digital Consistency, Digital Adaptation, and Digital Transformation) and three dimensions (Strategy, Employees, Processes). Each maturity level was represented by nine items (three per dimension), ensuring that the instrument covers the core features of digital governance in a holistic manner (see Appendix B Table A2).

Importantly, the questionnaire was explicitly tailored to the crisis and uncertainty context, asking respondents to evaluate their municipal digital governance practices in terms of preparedness, adaptation, and transformation during crises. This design enabled the

empirical assessment of how digital maturity supports municipal resilience. The development of items was guided by resilience theory (Boin et al., 2005) and digital transformation frameworks (Mergel, 2016; Taleb, 2012), ensuring both conceptual rigor and contextual relevance. Three Digital Governance (D) maturity levels include:

- *Digital Consistency* (Con) relates to core capabilities ensuring organizations' performance continuity, legal compliance, and stability during crises. Items (DConS1–DConS3) of the Strategy dimension focus on resource and ICT use; Employees' items (DConE1–DConE3)—on basic digital skills and crisis training; Processes' items (DConP1–DConP3)—on standardized planning and digital tools. The items in this category capture the resilience strategy of "bouncing back" by emphasizing continuity, risk reduction, and legal compliance. This aligns with theories suggesting that organizations first develop the capacity to maintain basic functions under adverse conditions (Boin et al., 2005).
- *Digital Adaptation* (Ada) involves proactive learning and incremental innovation (Fägerlind & Saha, 2016). Strategy dimension's items (DAdaS1–DAdaS3) reflect openness to new solutions; Employees' items (DAdaE1–DAdaE3)—on autonomous skill development; Processes' items (DAdaP1–DAdaP3) on collaborative goal-setting and iterative learning. The items move beyond continuity to emphasize learning, openness to new tools, and proactive improvement. This resonates with the resilience strategy of "bouncing forward," where crises accelerate adaptive changes in organizational routines (Manyena et al., 2011).
- *Digital Transformation* (Tra) is the highest maturity level, aiming to pioneer solutions (Mergel, 2016) and embrace high level municipal resilience (Taleb, 2012). Strategy's items (DTraS1–DTraS3) focus on innovative service models and emerging technologies; Employees' items (DTraE1–DTraE3)—on shared leadership and active participation; Processes' items (DTraP1–DTraP3)—on redesigning workflows and citizen-centric e-services. Organizations adapt and reconfigure to sustain digital growth. Items emphasize structural and cultural shifts where digital initiatives drive fundamental organizational changes, thereby cultivating innovation-oriented practices that thrive on disruption rather than merely withstand it.

Each of the three maturity levels—Digital Consistency, Digital Adaptation, and Digital Transformation—articulates distinct priorities and capabilities across three dimensions:

- *Strategy* reflects an organization's conceptual and long-term vision for Digital Governance. Items (S) under this dimension capture how digital initiatives are planned, funded, and guided by leadership, even amidst uncertainties.
- *Employees* address the human element, including the competencies, mindsets, and leadership styles that enable or inhibit digital progress. Items (E) here emphasize the role of leaders, the development of employees' skills, and collaborative innovation practices.
- *Processes* focus on the operationalization of Digital Governance, including the tools, workflows, and organizational structures in place. Items (P) measure the degree to which digital technologies are integrated into daily tasks and how these processes evolve in response to crises or uncertainties.

Each level, reflected in nine items (three per dimension), offers distinct and increasingly sophisticated attributes of digital governance, thereby enabling a structured assessment of municipal capabilities and progress:

At the lowest level, Digital Consistency (items DConS1–DConS3, DConE1–DConE3, DConP1–DConP3) focuses on maintaining stability, performance continuity, and legal compliance. These items reflect an organization's ability to "bounce back" from disruptions

using existing ICTs and standard procedures, ensuring service quality during crises and emphasizing crisis prevention, control, and adherence to prescribed technologies.

At the intermediate level, Digital Adaptation (items DAdaS1–DAdaS3, DAdaE1–DAdaE3, DAdaP1–DAdaP3) marks a shift towards proactive learning and experimentation. Strategy items highlight seeking new digital opportunities; Employee items show adaptable skills and managerial support; Process items focus on collaborative goal-setting and iterative learning. These measures indicate "bouncing forward," fostering growth through disruption.

At the highest level, Digital Transformation (items DTraS1–DTraS3, DTraE1–DTraE3, DTraP1–DTraP3) reflect strategic innovation and leadership. Strategy items aim for frontrunner status; Employees demonstrate trust, collaboration, and autonomy; Processes involve organizational redesign, user-centric services, and cultural shifts. These items measure an organization's capacity to be resilient, leading to transformative change.

The 27 items collectively formed an instrument that assessed Digital Governance maturity across the three interrelated dimensions and maturity levels (see Appendix B Table A2). This framework captures both breadth (encompassing strategic, human, and procedural aspects) and depth (progression from foundational to transformative capabilities), allowing for cross-municipal comparison and targeted improvement.

Overall, Cronbach's alpha values indicate strong internal consistency across all dimensions and maturity levels (see Appendix B Table A3).

All subscales (Strategy, Employees, Processes) have Cronbach's alpha values generally above 0.90, which indicates a high internal consistency for each latent variable. Even the lowest alpha (0.88) is still within a strong reliability range. Each maturity stage (Consistency, Adaptation, Transformation) shows similarly high alpha values for Strategy, Employees, and Processes. This suggests that the measurement items are reliably capturing each dimension at each level of digital governance maturity. The combined scales for each stage (9 items each) have very high alphas (0.965–0.975), and the overall Digital Governance scale (27 items) is at 0.988, suggesting a robust measurement for the entire construct (see Appendix B Table A4).

Across all three maturity levels (Consistency, Adaptation, Transformation), the means for each item typically hover around 7.0 to 7.8. This suggests that respondents generally rated these aspects of digital governance quite favorably. All the means are at least 6.5, indicating a positive perception of Strategy, Employees, and Processes across all maturity levels. Most items show negative skew (ranging roughly from -0.70 to -1.28), meaning that more responses are bunched toward the higher end of the scale. The consistently high means and negative skew may reflect a generally favorable stance among respondents or a tendency to rate these digital governance items positively. Kurtosis values are mostly in the range of about 0.20 to 1.46, indicating distributions that are slightly more peaked or heavy-tailed than a perfect normal distribution, but not drastically so. None of the kurtosis values are extremely high (>2 or 3), so there is likely no severe deviation from normality. Although the items lean toward higher ratings, absolute skewness and kurtosis values less than about 2 can be viewed as acceptable for parametric procedures (CFA, SEM). Overall, the data show strong positive perceptions across Strategy, Employees, and Processes at all maturity levels, with distributions that are slightly left-tailed but still close to acceptable for normal-based analyses.

3.3. Models for Testing Hypotheses

Statistical models were used to test the proposed hypotheses about interrelationships and interactions between the dimensions of Digital Governance and three maturity levels. The data analysis was conducted using Confirmatory Factor Analysis (CFA) and Struc-

tural Equation Modelling (SEM). CFA was utilized to verify the factor structure of the observed variables (Brown, 2015; Statistics Solutions, 2025a). It enabled the testing of the hypotheses regarding the interrelations among the observed variables of the maturity levels and associated dimensions. SEM helped to examine relationships between observed variables and latent constructs, combining elements of factor analysis and multiple regression (Tangi et al., 2021; Statistics Solutions, 2025b). Both methods were used to empirically test the Triadic Model for assessing local governments' Digital Governance maturity level in the context of municipal resilience.

H1 (interrelations among dimensions) was tested via Model 1 based on CFA (see Figure 1).

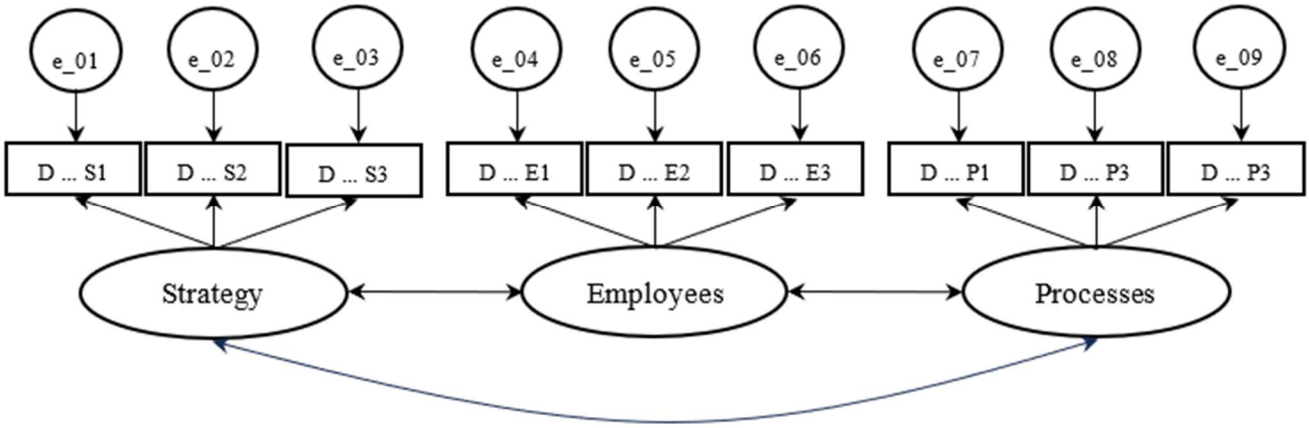

Figure 1. Model 1 CFA.

H2 (causal influence of Strategy) was tested via Model 2 based on SEM (see Figure 2).

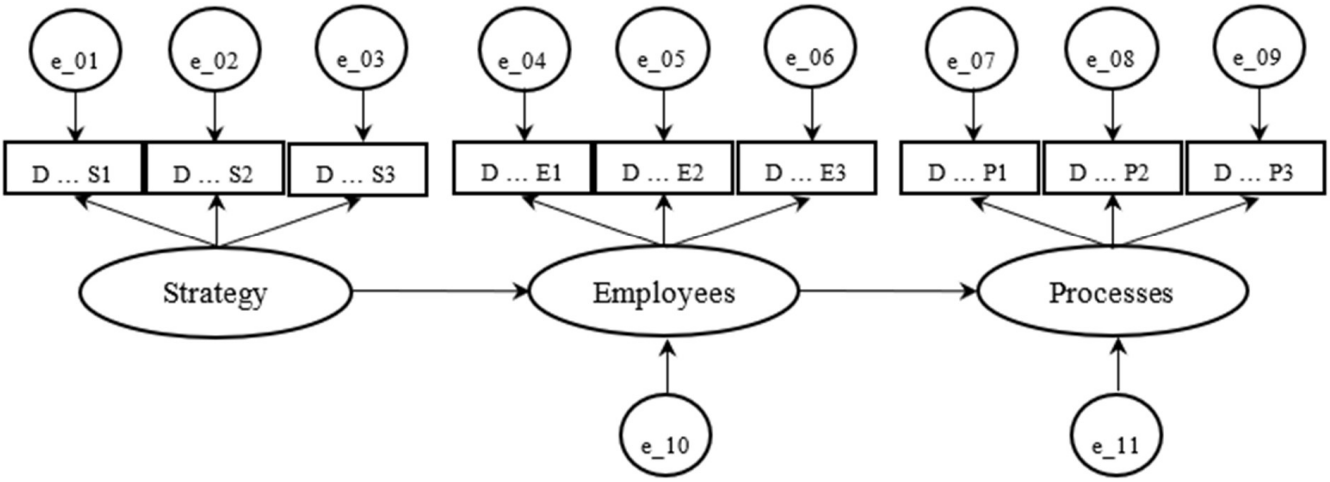

Figure 2. Model 2 SEM.

H3 (sequential development) was tested via Model 3 based on SEM (see Figure 3).

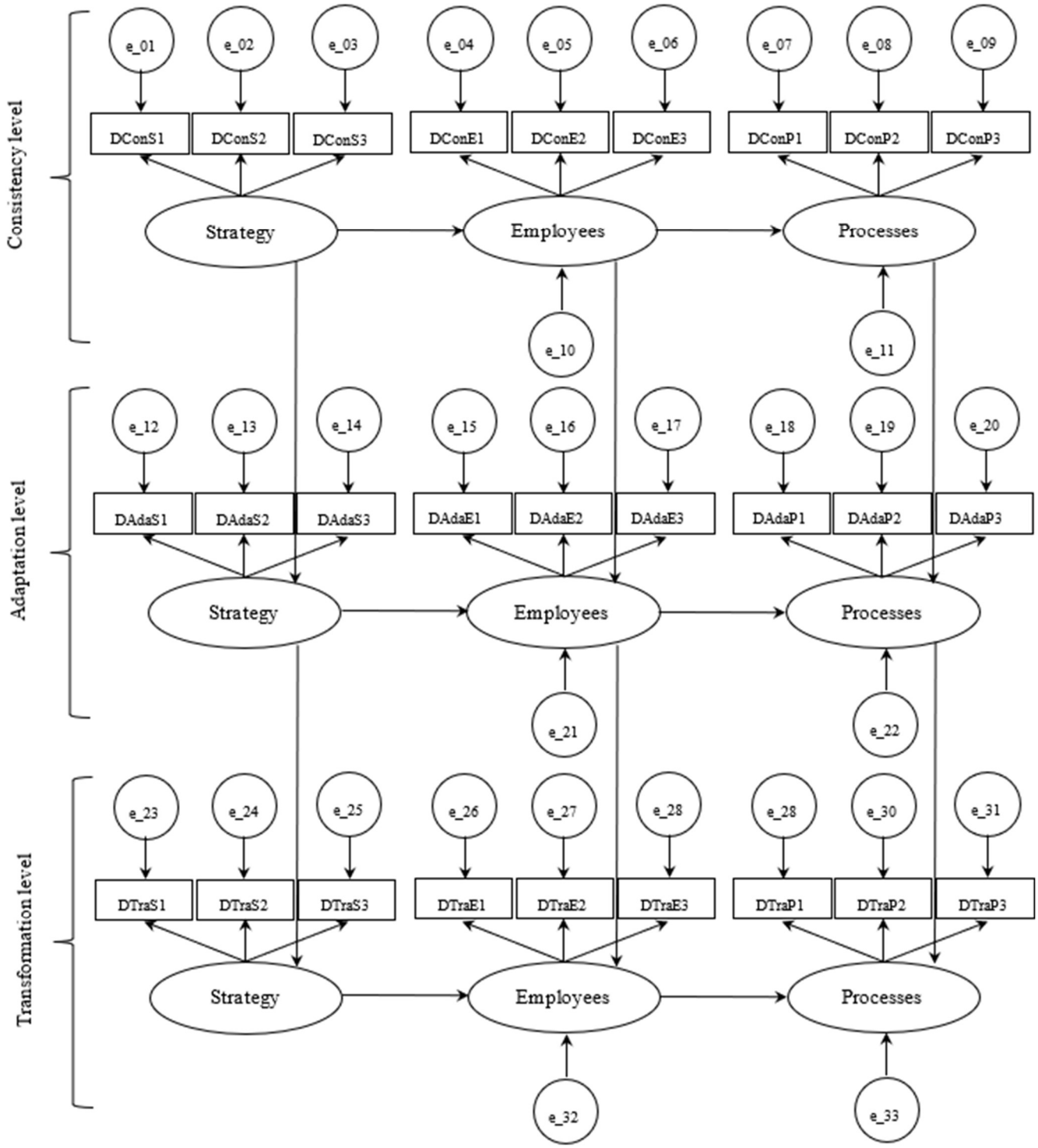

Figure 3. Model 3 SEM.

4. Results

4.1. Model Testing and Validation

To test H1, the study provided Model 1 fit statistics (see Appendix C Table A5) estimates of regression weights (see Appendix C Table A6) and estimates of covariances among exogenous variables in Model 1 (see Appendix C Table A7).

The Model 1 fit varies by maturity level, but relationships remain robust. *Adaptation* (Model 1a) shows the strongest overall fit (RMSEA = 0.064, CFI = 0.992, TLI = 0.988, GFI = 0.954), indicating an excellent fit of the three-factor structure (*Strategy*, *Employees*,

Processes) at the *Adaptation* stage. *Transformation* (Model 1t) has borderline/acceptable fit (RMSEA = 0.093, CFI = 0.982, TLI = 0.972) but still shows excellent factor loadings and positive inter-factor covariances. While *Consistency* (Model 1c) exhibits the weakest fit (RMSEA = 0.148), other indices (e.g., CFI = 0.950, TLI = 0.925) remain in an acceptable range. The high RMSEA may signal that the *Consistency model* needs further refinement or that the measurement model is less stable in early-stage Digital Governance settings.

All three dimensions are positively and significantly interrelated across models. The covariances among *Strategy*, *Employees*, and *Processes* are all positive, large in magnitude, and statistically significant ($p < 0.001$) for *Consistency* (Model 1c), *Adaptation* (Model 1a), and *Transformation* (Model 1t). This directly supports the hypothesis that, regardless of maturity level, these three dimensions of Digital Governance are meaningfully correlated.

Substantively, these results suggest that improving one dimension (e.g., *Strategy*) tends to co-occur with improvements in the other two (*Employees* and *Processes*). At each maturity level, strengthening one aspect of Digital Governance is positively associated with strengthening the others. Taken as a whole, the consistent, positive associations across all maturity levels support the notion that developing Digital Governance requires a coordinated effort in *Strategy*, *Employees* and *Processes*. Indeed, these three dimensions appear to reinforce each other. The results underscore the importance of simultaneously developing *Strategy*, *Employees*, and *Processes* to advance *from Consistency to Adaptation* and ultimately *to Transformation*. Nonetheless, the poorer fit in Model 1c highlights that at an early "*Consistency*" stage, the three-factor structure may not capture all aspects.

Overall, the significant positive covariances strongly support the hypothesis that these three dimensions of Digital Governance are interlinked. Even where model fit is less optimal (especially at the *Consistency* level), the pattern of positive relationships is evident, implying that improvements in each dimension tend to go hand in hand across all maturity stages.

To test H2, the study provided Model 2 fit statistics (see Appendix D Table A8) and estimates of regression weight (see Appendix D Table A9).

In the Model 2c (*Consistency*), it was found that RMSEA is high (0.154) and GFI/AGFI are low. Incremental indices (NFI, IFI, CFI) are acceptable but not stellar. It suggests a weaker overall fit. For the Model 2a (*Adaptation*), RMSEA (0.085) is borderline but still within the "reasonable" range. Excellent CFI, TLI, NFI, IFI. GFI/AGFI are also better. Overall, the best-fitting model among the three. And finally, in the Model 2t (*Transformation*) RMSEA (0.093) is borderline-to-poor, but CFI, TLI, NFI, IFI are excellent. GFI/AGFI are borderline acceptable. Better than 2c but not as strong as 2a for overall fit. Thus, Model 2a fits the data better than the other two according to most fit indices. This does not invalidate the structural relationships in 2c or 2t (the path coefficients are still significant in all three), but it does imply that *the Adaptation model* best captures the pattern of relationships among *Strategy*, *Employees*, and *Processes*.

Following Model 2 estimates of regression weights, all coefficients are positive and statistically significant ($p < 0.001$). For example, in Model 2a (Adaptation), for every 1-unit increase in *Strategy*, *Employees* increases by 0.748 units. Then, for every 1-unit increase in *Employees*, *Processes* increases by 1.341 units. Similar patterns hold in Model 2c and Model 2t. Taken together, these results indicate strong support for the directional relationships *Strategy* $\rightarrow$ *Employees* and *Employees* $\rightarrow$ *Processes*. All three models show positive, significant paths *from Strategy to Employees* and *from Employees to Processes*, as H2 hypothesized. Although the overall fit indices differ, the core causal chain *Strategy* $\rightarrow$ *Employees* $\rightarrow$ *Processes* is consistently supported. Thus, the data strongly confirms H2's premise that a well-defined *Strategy* affects the caliber or engagement of *Employees*, which in turn drives improved *Processes*.

In summary, the hypothesized chain (*Strategy* → *Employees* → *Processes*) is empirically validated by positive, significant coefficients across all three models. Model 2a (*Adaptation*) shows the best overall fit indices, but even in the lower-fit models, the structural relationships remain robust. Overall, the results align with H2.

To test H3, the study provided Model 3 fit statistics (see Appendix E Table A10) and estimates of regression weights (see Appendix E Table A11).

The model's fit indices indicate a poor to borderline fit, with significant Chi-square ($p < 0.001$) and RMSEA (0.11), suggesting it does not adequately represent the data. Although CFI (0.91) and TLI (0.89–0.90) are near acceptable thresholds, overall fit remains limited, possibly due to misspecification or missing variables. The regression results show strong, significant effects of *Strategy* on *Employees* across all stages (estimates 0.48–0.65), confirming its influence on employee competencies. *Employees* significantly predict *Processes*, especially at earlier stages (estimates > 1.6). Additionally, the significant positive paths *from Consistency to Adaptation* (0.97) and *from Adaptation to Transformation* (0.79) support the hypothesis of sequential digital maturity development, with core dimensions positively affecting subsequent phases.

As it was mentioned, the Model's 3 SEM fit indices indicate limited adequacy, with significant Chi-square values and a high RMSEA, suggesting that the current model (see Figure 3) does not adequately represent the data. Although the CFI and TLI are close to acceptable thresholds, the overall fit remains inadequate, possibly due to misspecification. Due to these findings, modified Hypothesis 3 has been tested.

H3m: *Digital Governance maturity proceeds through sequential stages—Consistency, Adaptation, and Transformation—with Employees serving as the starting point* (see Figure 4). Robust employee competencies and engagement inform the creation of sound strategies, while strategies and employees together shape core processes. Without an adequately skilled workforce, strategic initiatives fall short, hindering the organization's ability to progress to the adaptation stage and ultimately achieve full digital transformation.

To test the modified H3, i.e., H3m, the study provided Model 3m fit statistics (see Appendix E Table A10) and estimates of regression weights (see Appendix E Table A12).

The fit indices for the modified model show improvement but remain limited. The CFI (0.91) and TLI (~0.90) indicate marginally acceptable fit, yet the RMSEA remains high at 0.107, reflecting ongoing model misfit. Path estimates highlight the central role of *Employees*, with strong effects on *Strategy* (1.007–1.33) across all maturity levels. *Employees* also significantly influence *Processes* (0.75–0.96), emphasizing their foundational importance in digital development. The modified model reveals that *Employees* consistently predict both *Strategy* and *Processes*, especially at earlier stages. The influence of *Strategy* on *Processes* is significant initially (0.45–0.28) but decreases at higher levels and becomes non-significant at *Transformation*. Pathways *from Adaptation to Transformation* are notably strong (0.56–1.02), underscoring the importance of progressing through *Adaptation* to achieve full digital maturity.

The results support the concept of sequential development in Digital Governance maturity, with both models highlighting the critical role of foundational elements—particularly *Employees*—in progressing through maturity levels. *Employees* consistently exert a strong influence on *Strategy* and *Processes* across all levels, emphasizing the importance of developing employee capabilities to achieve digital maturity. These findings reaffirm the pivotal role of employees' development in supporting effective Digital Governance in local governments.

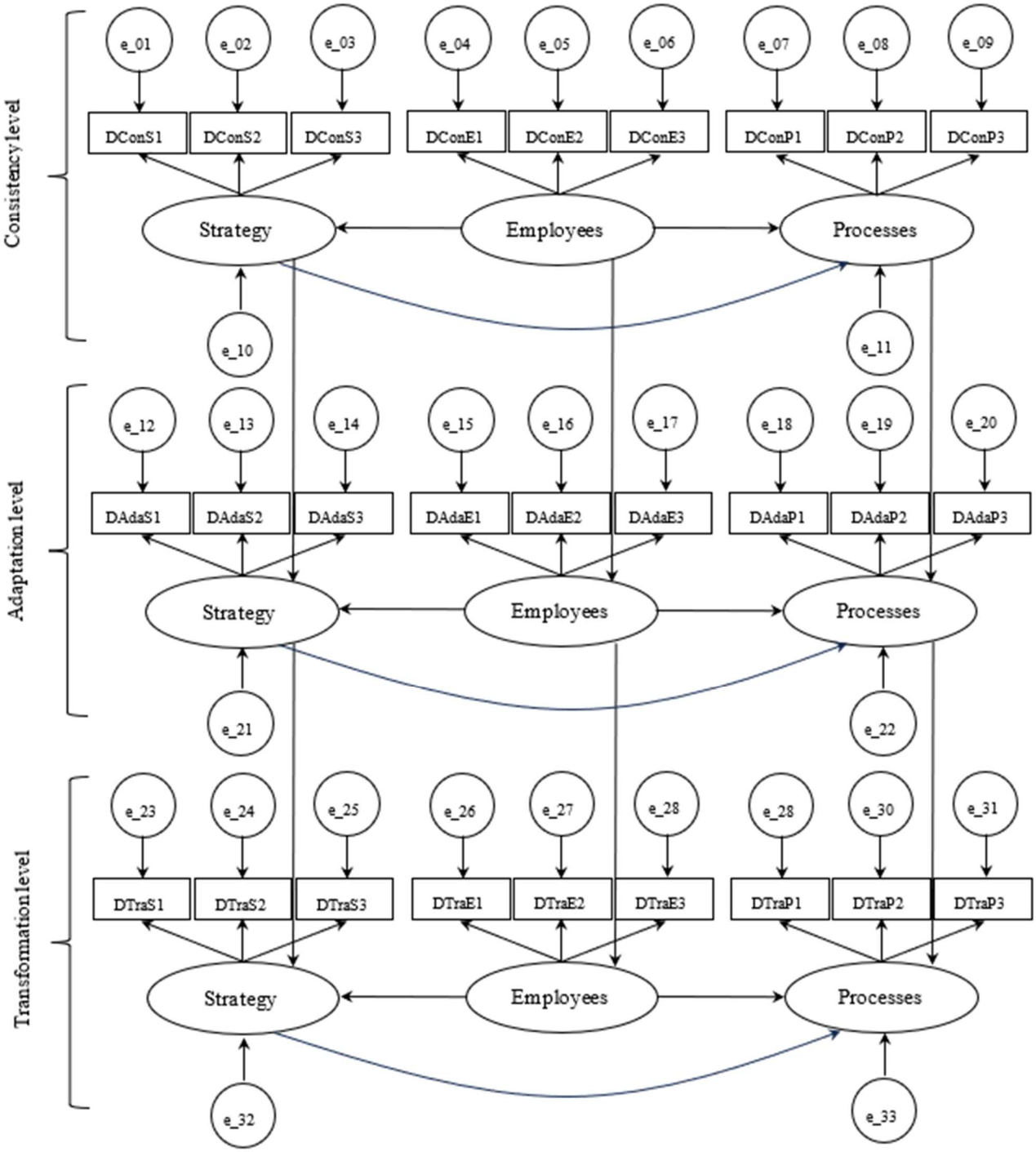

Figure 4. Model 3m SEM.

4.2. Evaluations of Digital Governance Maturity in Lithuanian Municipalities

In Lithuania, the administrative structure comprises 60 municipalities, including 9 city municipalities and 6 so-called "ring municipalities" and 45 other municipalities. City municipalities, such as Vilnius, Kaunas, and Klaipėda, encompass only urban territories and perform functions typical of densely populated areas with concentrated infrastructure and public services. In contrast, ring municipalities—those surrounding major cities like Vilnius District or Kaunas District—are characterized by intensive functional interlinkages with the adjacent urban centers.

Although the dataset includes detailed digitalization scores for each of the 60 Lithuanian municipalities, the analysis in this article focuses on group-level averages—

distinguishing between city, ring, and other municipalities. This approach was chosen to ensure analytical clarity and international relevance, as presenting results for individual municipalities would offer limited scientific value beyond the national context. Moreover, the data show no cases of municipalities performing exceptionally high in one maturity stage (e.g., Digital Transformation) while performing poorly in others. Therefore, aggregated group averages more accurately reflect general trends and relative differences across local government types in terms of Digital Governance maturity.

Figure 5 illustrate how Lithuanian municipalities evaluate their performance across the three dimensions of the Triadic Model—Strategy (A), Employees (B), and Processes (C)—at the three maturity levels of Digital Consistency, Digital Adaptation, and Digital Transformation.

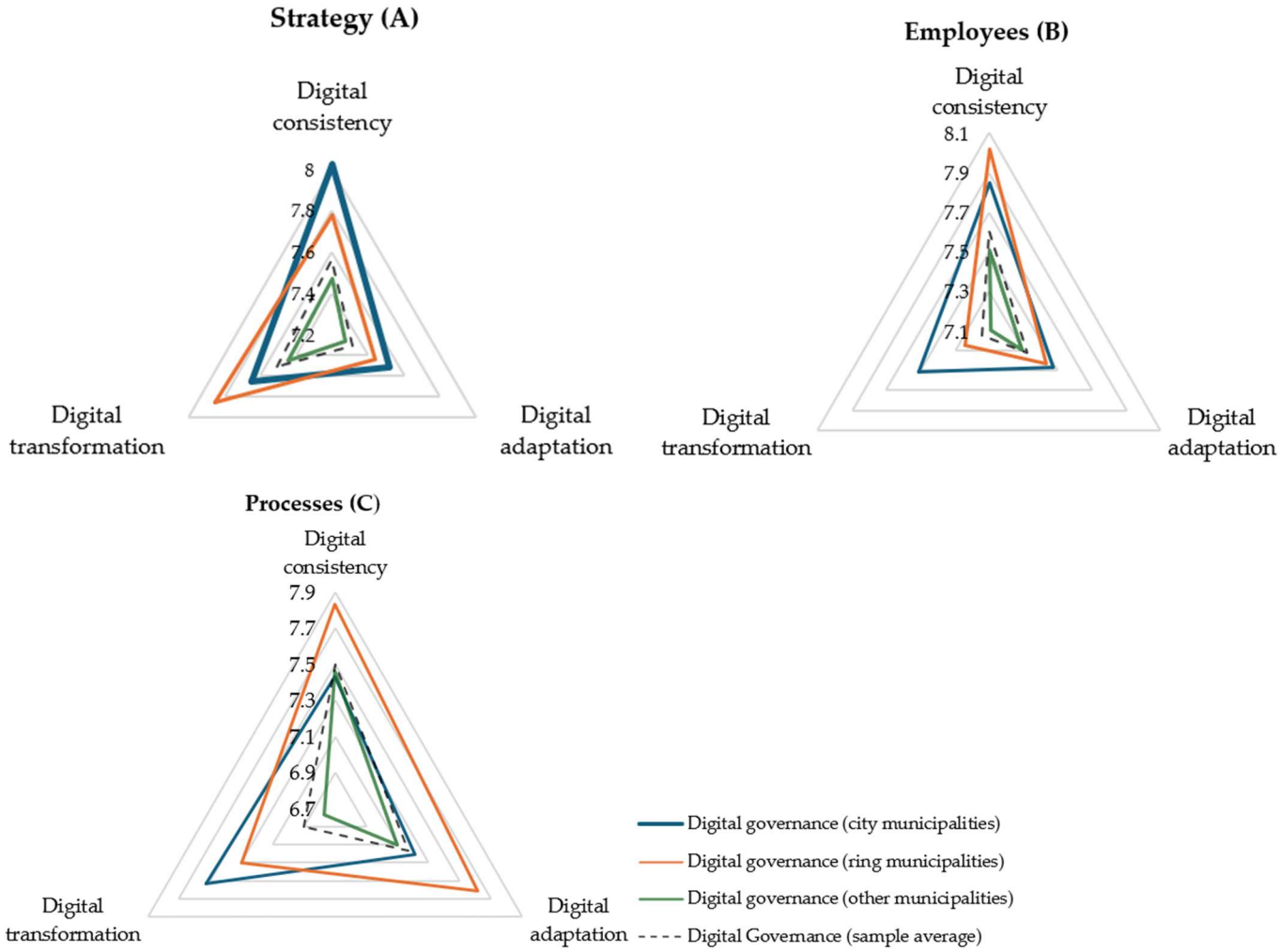

Figure 5. Assessment of Digital Governance maturity in Lithuanian municipalities based on the Triadic Model.

Across all municipal types, Digital Consistency scores are higher than those for Adaptation or Transformation in each of the three dimensions—Strategy, Employees, and Processes. This pattern indicates that Lithuanian municipalities, regardless of size or type, are primarily focused on ensuring stability and continuity in their digital operations, while placing comparatively less emphasis on flexibility and advanced transformation processes.

In the Strategy dimension, city municipalities achieve the highest overall evaluations (Consistency = 8.02; Adaptation = 7.52; Transformation = 7.65), showing well-established strategic direction and commitment to digital development. Ring municipalities perform

slightly lower (7.78; 7.44; 7.85), though they nearly match cities in the transformation stage, suggesting growing strategic maturity. Smaller municipalities score more modestly (7.47; 7.27; 7.45), emphasizing compliance and operational maintenance rather than innovation. The overall sample averages (7.56; 7.31; 7.51) confirm that digital transformation remains less developed than strategic consistency across the country.

The Employees dimension shows a slightly different pattern. Ring municipalities record the highest consistency score (8.02), reflecting strong organizational stability and clearly defined responsibilities. However, transformation levels are lower (7.24), and adaptation remains moderate (7.43). City municipalities display comparable results but lag slightly behind in adaptation (7.47) and transformation (7.51), indicating a potential gap in employee readiness for digital innovation. Overall averages (7.60; 7.32; 7.14) confirm that workforce adaptation remains a critical challenge.

In the Processes dimension, ring municipalities again lead (Consistency = 7.83; Adaptation = 7.61; Transformation = 7.30), demonstrating structured and integrated workflows aligned with digital governance principles. City municipalities follow closely (7.43; 7.21; 7.53), whereas smaller municipalities remain below the average (7.46; 7.10; 6.77). The lowest national mean values (7.50; 7.17; 6.90) indicate that operational transformation is still emerging and that procedural modernization lags behind strategic planning.

Overall, ring municipalities exhibit the most balanced digital development, cities lead strategically but face human-capital constraints, and smaller municipalities remain focused on operational stability rather than transformation.

The tested and validated Triadic Model not only advances theoretical understanding of Digital Governance maturity but also offers practical and managerial value for municipalities. The model enables each municipality to identify its specific strengths and areas requiring improvement. The comparative analysis demonstrates that municipalities can use this framework as a diagnostic tool to evaluate their current digital governance capacity and to prioritize targeted interventions. For instance, municipalities strong in strategic consistency but weaker in employee adaptability can focus on capacity-building and change management, while those with established digital processes can progress toward integrated, citizen-centric transformation. Consequently, the Triadic Model provides actionable guidance for local governments and policymakers seeking to enhance municipal resilience and achieve balanced, stage-specific progress in digital governance implementation in the context of crisis.

5. Discussion

The primary novelty of this study lies in the development of a holistic, empirically validated Triadic Model specifically tailored to local governments, coupled with its application in the critical context of crisis response to reveal the intricate interrelations among its dimensions. Moving beyond traditional e-government or private-sector frameworks (Eggers & Bellman, 2015; Zakiuddin et al., 2024), the model captures the progression from basic to transformative stages, aligning with recent scholarly emphases on digital maturity, resilience and adaptability in times of crisis (Boin et al., 2005; Lekkas & Souitaris, 2023; Nielsen et al., 2024).

The empirical findings support the theoretical sequence proposed in the hypotheses—highlighting the innovative aspect of this research—particularly the central role of Employees in advancing Digital Governance maturity. Consistent with prior studies (Tubis, 2023; Haryanti et al., 2023), the results show strong, positive interrelations among Strategy, Employees, and Processes across all levels, highlighting their interconnected development. These covariances suggest that improvements in one dimension tend to mutually reinforce

progress in others, corroborating recent scholarly views on digital capabilities' symbiotic growth (Aras & Büyüközkan, 2023; Kaszás et al., 2023).

The findings specifically underscore the pivotal role of Employees, echoing previous research that highlights workforce competencies and engagement as crucial drivers of successful digital transformation in the context of strengthening municipal resilience (Tubis, 2023; Aristovnik et al., 2024). Employees significantly influence Strategy and Processes, reinforcing the view that human capital development is fundamental to digital maturity and municipal resilience (He et al., 2023; Wu et al., 2017; Nkomo & Kalisz, 2023). Within this framework, employee capacity strengthens process efficiency and service delivery, while strategic leadership aligns human potential with organizational goals, together forming the organizational capabilities that sustain digital transformation and resilience. Importantly, their dominant role at early stages supports the need for capacity-building and change management strategies outlined in digital transformation frameworks (Mergel, 2016; Taleb, 2012).

This study contributes to the theoretical development of Digital Governance research by conceptualizing and empirically validating the Triadic Model, which integrates the strategic, human, and procedural dimensions of digital maturity into a single analytical framework. The model extends prior maturity approaches by demonstrating how interrelations among these dimensions evolve across sequential stages—Consistency, Adaptation, and Transformation—and by linking them to organizational resilience in crisis contexts. This multidimensional perspective advances Digital Governance theory beyond technology- or service-centered paradigms, offering an integrative explanation of how digital transformation unfolds within local governments. Moreover, the validated model provides a foundation for future comparative and longitudinal studies seeking to measure digital maturity and its contribution to public-sector resilience.

From a managerial and policy perspective, the Triadic Model serves as a diagnostic and decision-support tool for local governments. It enables municipalities to assess their position within the maturity pathway and to identify which dimensions—Strategy, Employees, or Processes—require targeted improvement. Municipal executives can apply the model to design tailored capacity-building programs, align strategic objectives with operational processes, and monitor progress toward digital transformation. Policymakers at the national level can use these insights to allocate resources more effectively, prioritize training for digital competencies, and foster cooperation between city, ring and other municipalities. In this way, the model informs both managerial decision-making and broader public policy aimed at strengthening municipal resilience and adaptive governance capacity.

Further, future research could explore possibilities of this Triadic Model in assessing digital governance maturity in different contexts, following the influence of such constructs as organizational culture or leadership styles, which are important for the digital transformation (Rybnikova et al., 2022; He et al., 2023). Longitudinal design and comparative cross-national studies could deepen understanding of the dynamic and contextual factors shaping digital maturity pathways (Susilowati et al., 2025; Horák & Špaček, 2024). While Lithuania—an acknowledged leader in Digital Government (OECD, 2024; Lithuania Co-create, 2024)—offers valuable empirical insights, it is important to recognize that the applicability of this model should be tested in other small, advanced, and digitally invested countries, such as Estonia or Latvia, which share similar institutional features and priorities regarding digitalization. These countries often invest heavily in digital infrastructure and have comparable policy frameworks, making them suitable contexts for further validation of the Triadic Model. However, the current study's focus on Lithuania reflects its specific institutional environment and support for digital transformation, which may limit generalizability to larger, more decentralized, or emerging economies. To strengthen the external

validity of the model, future research could test its relevance across diverse governance structures or countries with different levels of digital maturity, thereby providing a more comprehensive understanding of its universal applicability and limitations.

Main research limitations are reliance on self-reported data and the cross-sectional nature. This study relies on self-reported survey responses from municipal officials as the sole data source. This approach may introduce response biases (e.g., social desirability), as respondents might perceive pressure to present their municipality's digital efforts favorably. We mitigated this risk through anonymous data collection and neutral question wording; however, the possibility of overstated maturity levels cannot be eliminated. Readers should interpret the findings as officials' perceptions of digital governance maturity, which, while insightful, may differ somewhat from objective performance. Moreover, this study acknowledges the inherent limitation of using a cross-sectional design for modelling a developmental sequence. While the significant paths observed are consistent with the proposed causal ordering, cross-sectional data does not permit definitive causal inference. Accordingly, our findings are framed as supportive of theoretical progression rather than conclusive evidence of causality, and we emphasize the need for future longitudinal studies to validate the temporal dynamics proposed in the model. Despite the research limitations mentioned, this research offers a valuable contribution to scientific literature by empirically validating a holistic framework for assessing Digital Governance maturity in local governments, underscoring the essential role of Employees, and reinforcing the importance of a staged, integrated approach to digital transformation. This provides a foundation for both scholarly advancement and practical application in small, developed country contexts and beyond.

6. Conclusions

This study empirically validated the Triadic Model as a comprehensive framework for assessing Digital Governance maturity in local governments, highlighting its focus on the interconnectedness of three core dimensions—Strategy, Employees, and Processes—across three levels of Digital Maturity: Consistency, Adaptation, and Transformation. Unlike existing models that often evaluate these elements in isolation, this research demonstrates that the mutual reinforcement among these dimensions is critical, especially in the context of crisis response and building resilience. The positive relationships confirmed by the CFA support the theoretical foundation that effective digital governance depends on synchronised progress across strategy, workforce capabilities, and operational processes.

Significantly, the findings underscore Employees as the foundational element, exerting a strong influence on Strategy and Processes at all levels, thereby reaffirming the crucial role of workforce competencies in fostering digital maturity, particularly during uncertainties. The SEM results validated that higher maturity levels are contingent upon the successful establishment of foundational phases, confirming the hypothesised sequential pathway from basic compliance to innovative transformation. This progression emphasizes the importance of capacity-building at early stages to enable subsequent growth, agility, and organizational innovation—elements essential for municipal resilience in crises.

The validated Triadic Model thus contributes to theory by offering an integrative perspective on Digital Governance maturity and provides a diagnostic tool for practice, guiding municipalities in identifying their strengths and development priorities. Its application in Lithuania demonstrates both conceptual robustness and practical relevance, offering a transferable framework for policymakers and local authorities seeking to enhance resilience through digital transformation in varied national and institutional contexts.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/admsci15110435/s1, Figure S1: Research Questionnaire and Informed Consent Statement.

Author Contributions: Conceptualization, R.T., M.B., I.B. and V.J.; methodology, R.T., M.B., I.B. and V.J.; software, M.B. and V.J.; validation, M.B.; formal analysis, R.T., M.B., I.B. and V.J.; investigation, R.T. and M.B.; resources, R.T., I.B. and V.J.; data curation, M.B. and I.B.; writing—original draft preparation, R.T., M.B. and V.J.; writing—review and editing, R.T., M.B., I.B. and V.J.; visualization, M.B.; supervision, R.T.; project administration, R.T.; funding acquisition, R.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Research Council of Lithuania (LMTLT), agreement No. S-VIS-23-10. And the APC was funded by Research Council of Lithuania (LMTLT), agreement No. S-VIS-23-10.

Institutional Review Board Statement: Ethical review and approval were waived for this study as the institution, managing the project, does not have the Institutional Review Board. However, the Informed Consent Statement includes details regarding the research policy.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author due to privacy and ethical reasons.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Digital and e-government maturity models and dimensions.

References *	Model Name	Dimensions	Notes
(Meyerhoff Nielsen, 2017)	eGovernment benchmark model	User-centric government, transparency, cross-border mobility, and key enablers	Used by European Commission since 2002.Assessing maturity of service accessibility.Focused on service delivery
(Eggers & Bellman, 2015)	Deloitte's digital government model	People, processes, preparedness. More developed version: digital strategy, leadership capabilities, workforce skills development, user focus, and cultural norms	Assessing maturity at organizational level. Focused on organizational capabilities and service delivery
(Joshi & Islam, 2018)	E-government maturity model for sustainable E-government services	Detailed assimilation process, streamlined services, state of art of technology, agile accessibility, awareness and trust, and quality of service.	Assessing maturity of service accessibility. Focused on service delivery.
(Magnusson & Nilsson, 2019)	DiMiOS: A model for government digital maturity	Digital capability (ability of the organization to sense, seize and re-configure based on digital opportunities in line with definitions of dynamic capabilities), and digital heritage (the impact of previous investments/initiatives in information infrastructure that either facilitates or constrains organizational maneuverability in line with definitions of technology debt)	Assessing maturity of service accessibility. Focused on organizational capabilities.
(Panayiotou & Stavrou, 2019)	Maturity assessment framework	Information (quality, availability, and management of information), interaction (level and quality of interaction and communication between the local government and citizens), transaction (ability to conduct online transactions and deliver services electronically), integration (integration of web services with backend systems and other government platforms), citizen participation (extent to which citizens are involved in the design and improvement of services).	The framework featured 64 criteria. Assessing maturity of service accessibility. Focused on service delivery.
(Kafel et al., 2021)	Multidimensional public sector organizations' digital maturity model	Digitalization, focused on management, digital competencies of employees, openness of stakeholder's needs, process digitalization, digital technologies, e-innovativeness.	Assessing maturity at organizational level. Focused on organizational capabilities and service delivery.
(Nerima & Ralyté, 2021)	Digital maturity balance model for public organizations	Data, IT governance, strategy, organization, process	Assessing maturity at organizational level. Focused on organizational capabilities and service delivery.

Table A1. *Cont.*

References *	Model Name	Dimensions	Notes
(Khademi & Khademi, 2022)	Model for measuring e-government maturity	Web presence, government-citizen interaction, transaction, integration.	Assessing maturity of service accessibility. Focused on service delivery.
(Hujran et al., 2023)	SMARTGOV, an Extended Maturity Model	Technology (infrastructure and tools), data (data quality, availability, and usage), process (optimization and automation), organization (culture, capabilities, structure, strategy), service (citizen-centric design and delivery), impact (societal and economic outcomes).	Assessing maturity at organizational level. Focused on organizational capabilities and service delivery.
(Patergiannaki & Pollalis, 2023)	e-Government maturity model	Emerging information services, enhanced information services, transactional services, connected services.	Assessing maturity of service accessibility. Focused on organizational capabilities and service delivery.
(HosseiniNasab, 2024)	Maturity-driven selection model	Governance structure, strategic alignment, resource management, risk assessment, performance measurement.	Assessing maturity at organizational level. Focused on organizational capabilities and service delivery.
(Aristovnik et al., 2024)	Model for measuring the digital state in public administration organizations	Technology, structure, people, organizational culture, processes, external environment, good governance, digitalization.	Assessing maturity at organizational level. Focused on organizational capabilities and service delivery.
(Zakiuddin et al., 2024)	Digital service transformation maturity model	Objectives, training, structure, process, policy.	Assessing maturity at organizational level. Focused on organizational capabilities and service delivery.

* Lines indicated in grey are beyond the scope of this maturity assessment, which focuses solely on service delivery (government-citizen interaction) without addressing the organizational preparedness and capabilities required to provide such services.

Appendix B

Table A2. The structure of Digital Governance maturity measurement instrument.

Component			Items	Abbreviation
Digital Consistency	Strategy	1.	Digital governance is implemented gradually according to planned schedules, and during crises, existing resources are utilized to the maximum extent	DConS1
		2.	Digital governance helps prepare for crisis prevention, ensures control, and preserves existing abilities (e.g., operational quality levels)	DConS2
		3.	In our organization, digital governance occurs using existing information and communication technology (ICT) tools to ensure business continuity and stability and reduce risks and vulnerabilities	DConS3
	Employees	1.	Our employees can use digital tools and official municipal ICT channels	DConE1
		2.	The stability and support of digital activities are essential for managers who use official municipal ICT channels, tools, and control how employees use them	DConE2
		3.	In response to crises, training is provided to update employees' knowledge and skills on digitalization	DConE3
	Processes	1.	Digital governance is developed through precise planning, action design, and employee supervision	DConP1
		2.	In times of crisis, we use existing ICT channels and tools to ensure the stability and continuity of our operations	DConP2
		3.	Using digital tools ensures high-quality process management in times of crisis	DConP3
Digital Adaptation	Strategy	1.	In our organization, digital governance is developed in a constant search for novel resources and opportunities	DAdaS1
		2.	We see crises as an opportunity to start the use of alternative digital tools or channels that support the quality of activities (speed, accessibility, transparency, etc.)	DAdaS2
		3.	Our organization emphasizes the need for digital governance and cooperation in developing new digital solutions that respond to new situations and needs	DAdaS3
	Employees	1.	Employees have good skills in using digital tools, can quickly adapt to new ICT tools and channels and start other digital tools themselves to achieve operational efficiency	DAdaE1
		2.	Managers are at the forefront of digital advancement, driving change in digitalization, looking for new opportunities, and allowing employees to use a wide range of ICT channels and tools	DAdaE2
		3.	To adapt to the changing environment, we encourage employees to constantly update their digitalization knowledge and skills and develop and implement new ICT systems, channels, and tools necessary for operational efficiency	DAdaE3

Table A2. *Cont.*

Component			Items	Abbreviation
Digital Adaptation	Processes	1.	We involve employees in defining the goals and aims of the organization's digital governance development and discussing the implemented activities	DAdaP1
		2.	While standard ICT tools and channels dominate our organization, we encourage employee digitalization initiatives that help to adapt to changing conditions and needs in times of crisis	DAdaP2
		3.	In times of crisis, we stay optimistic and creative, work in teams, and offer new digital practices, testing them and learning from mistakes	DAdaP3
Digital Transformation	Strategy	1.	One of the most important goals for the development of digital governance in times of crisis is an organization's ability to focus on digital innovation, anticipation of the future, dynamism, digital change, and progress	DTraS1
		2.	In times of crisis, we seek opportunities to ensure continuity, quality, and digital accessibility by becoming the frontrunners of digital change	DTraS2
		3.	Our organization's digital governance development goals are to introduce new administrative service delivery models based on digital technologies, increase operational efficiency through ICT tools, and respond to the latest digital trends	DTraS3
	Employees	1.	DTraE1 Employees make decisions based on their prior digitalization experiences. They trust the team and pool collective knowledge to solve problems using digital tools	DTraE1
		2.	DTraE2 During the work process, we consider changes in the environment, which we see as an opportunity to grow. We are ready to think and act non-traditionally in the digital space (e.g., using artificial intelligence tools)	DTraE2
		3.	DTraE3 Our organization's managers and ICT specialists work together as partners, discuss, encourage, and support new digitalization initiatives, give employees more freedom to act, and advise employees in good faith on issues that arise	DTraE3
	Processes	1.	DTraP1 Our organization constantly discusses digital transformation to be ready to react, act, and make innovative proposals in times of crisis	DTraP1
		2.	DTraP2 Our organization's digital governance processes are transforming its structure and culture, changing leadership practices (e.g., guided by ICT tools and channels), and providing flexibility in work forms and places	DTraP2
		3.	DTraP3 We focus on the citizen as a customer by updating digital technologies. We provide e-services through the e-government gateway, install user-friendly tools, and adapt digital tools to provide personalized services	DTraP3

Table A3. Cronbach alpha measures for latent variables.

Group of Items	Number of Items	Cronbach's Alpha
	Digital Consistency	
Strategy	3	0.935
Employees	3	0.880
Processes	3	0.934
Digital Consistency	9	0.965
	Digital Adaptation	
Strategy	3	0.940
Employees	3	0.926
Processes	3	0.948
Digital Adaptation	9	0.975
	Digital Transformation	
Strategy	3	0.930
Employees	3	0.929
Processes	3	0.931
Digital Transformation	9	0.968
Digital Governance	27	0.988

Table A4. Summary statistics of items.

Component		Abbreviation	Mean	95% C.I.	St. Deviation	Skewness	Kurtosis
Digital Consistency	Strategy	DConS1	7.48	(7.17, 7.78)	2.08	−1.04	0.94
		DConS2	7.64	(7.35, 7.92)	1.91	−1.11	1.13
		DConS3	7.58	(7.30, 7.86)	1.91	−1.08	0.90
	Employees	DConE1	7.88	(7.63, 8.13)	1.69	−0.84	0.64
		DConE2	7.63	(7.30, 7.95)	2.21	−1.28	1.31
		DConE3	7.17	(6.83, 7.52)	2.35	−1.02	0.44
	Processes	DConP1	7.15	(6.84, 7.46)	2.12	−1.06	0.51
		DConP2	7.75	(7.46, 8.03)	1.92	−1.15	1.07
		DConP3	7.58	(7.29, 7.86)	1.94	−1.17	1.28
Digital Adaptation	Strategy	DAdaS1	7.42	(7.11, 7.74)	2.13	−1.20	1.46
		DAdaS2	7.15	(6.81, 7.48)	2.26	−1.04	0.69
		DAdaS3	7.35	(7.01, 7.69)	2.30	−1.23	1.26
	Employees	DAdaE1	7.07	(6.79, 7.35)	1.89	−0.70	0.41
		DAdaE2	7.42	(7.06, 7.78)	2.44	−1.27	1.03
		DAdaE3	7.38	(7.05, 7.71)	2.24	−1.25	1.24
	Processes	DAdaP1	7.02	(6.70, 7.34)	2.20	−0.82	0.13
		DAdaP2	7.02	(6.69, 7.34)	2.23	−0.91	0.38
		DAdaP3	7.44	(7.12, 7.75)	2.16	−0.87	0.20
Digital Transformation	Strategy	DTraS1	7.70	(7.41, 7.99)	1.98	−1.13	1.20
		DTraS2	7.32	(7.00, 7.64)	2.17	−1.16	1.26
		DTraS3	7.43	(7.12, 7.74)	2.13	−1.11	1.24
	Employees	DTraE1	7.35	(7.08, 7.62)	1.83	−0.91	0.87
		DTraE2	6.81	(6.49, 7.13)	2.17	−0.88	0.44
		DTraE3	7.17	(6.82, 7.52)	2.38	−1.07	0.54
	Processes	DTraP1	6.59	(6.21, 6.96)	2.54	−0.79	−0.04
		DTraP2	6.82	(6.48, 7.15)	2.30	−0.88	0.23
		DTraP3	7.33	(6.98, 7.67)	2.34	−1.00	0.34

Appendix C

Table A5. Model 1 fit statistics.

Fit Index	Description	Acceptable/Good Guidelines	Model 1c (Consistency)	Model 1a (Adaptation)	Model 1t (Transformation)
Chi-Square (χ^2) Test	Tests difference between observed and model-estimated covariance matrices.	Non-significant χ^2 ($p > 0.05$) indicates acceptable fit, but sensitive to sample size.	$\chi^2(24) = 118.666$, $p < 0.001$	$\chi^2(24) = 41.776$, $p = 0.014$	$\chi^2(24) = 60.847$, $p < 0.001$
Root Mean Square Error of Approximation (**RMSEA**)	Evaluates how well the model approximates the population data.	<0.05 = Close fit; 0.05–0.08 = Reasonable fit; >0.10 = Poor fit.	0.148 (Poor fit)	0.064 (Reasonable fit)	0.093 (Borderline/Poor)
Comparative Fit Index (**CFI**)	Compares model fit to a baseline (independence) model.	≥0.95 often indicates good fit.	0.950 (Good)	0.992 (Excellent)	0.982 (Excellent)

Table A5. *Cont.*

Fit Index	Description	Acceptable/Good Guidelines	Model 1c (Consistency)	Model 1a (Adaptation)	Model 1t (Transformation)
Tucker–Lewis Index (**TLI**)/Non-Normed Fit Index (**NNFI**)	Adjusts χ^2 for model complexity, comparing target and null models.	$\geq$0.90 acceptable; $\geq$0.95 preferred for good fit.	0.925 (Acceptable)	0.988 (Excellent)	0.972 (Excellent)
Goodness-of-Fit Index (**GFI**) and Adjusted GFI (**AGFI**)	Reflect amount of variance explained by the model; AGFI adjusts for complexity.	Historically $\geq$ 0.90 acceptable but less used today.	GFI = 0.870, AGFI = 0.757 (Below desired)	GFI = 0.954, AGFI = 0.913 (Good)	GFI = 0.928 (Good), AGFI = 0.865 (Slightly low)
Normed Fit Index (**NFI**) and Incremental Fit Index (**IFI**)	Compare model to null model; IFI adjusts for sample size.	$\geq$0.90 acceptable, higher is better.	NFI = 0.939, IFI = 0.951 (Good)	NFI = 0.982, IFI = 0.992 (Excellent)	NFI = 0.970, IFI = 0.982 (Excellent)
Overall Interpretation	Summary of fit indices		Poor overall fit (High RMSEA, moderate GFI/AGFI) despite good incremental fit indices	Best overall fit (Reasonable RMSEA, high GFI/AGFI, excellent incremental indices)	Good incremental fit but borderline RMSEA; not as strong as Model 1a but better than Model 1c

Table A6. Model 1 estimates of regression weights.

Model 1c (Consistency)		Model 1a (Adaptation)		Model 1t (Transformation)	
Regression Path	**Estimate (S.E.)**	**Regression Path**	**Estimate (S.E.)**	**Regression Path**	**Estimate (S.E.)**
DConS1 ← Strategy	1.000	DAdaS1 ← Strategy	1.000	DTraS1 ← Strategy	1.000
DConS2 ← Strategy	0.938 (0.050) ***	DAdaS2 ← Strategy	1.061 (0.057) ***	DTraS2 ← Strategy	1.284 (0.076) ***
DConS3 ← Strategy	0.967 (0.048) ***	DAdaS3 ← Strategy	1.154 (0.052) ***	DTraS3 ← Strategy	1.229 (0.075) ***
DConE1 ← Employees	1.000	DAdaE1 ← Employees	1.000	DTraE1 ← Employees	1.000
DConE2 ← Employees	1.571 (0.123) ***	DAdaE2 ← Employees	1.614 (0.104) ***	DTraE2 ← Employees	1.237 (0.068) ***
DConE3 ← Employees	1.691 (0.131) ***	DAdaE3 ← Employees	1.459 (0.096) ***	DTraE3 ← Employees	1.385 (0.072) ***
DConP1 ← Processes	1.000	DAdaP1 ← Processes	1.000	DTraP1 ← Processes	1.000
DConP2 ← Processes	0.879 (0.040) ***	DAdaP2 ← Processes	1.044 (0.038) ***	DTraP2 ← Processes	0.912 (0.036) ***
DConP3 ← Processes	0.848 (0.044) ***	DAdaP3 ← Processes	0.932 (0.046) ***	DTraP3 ← Processes	0.820 (0.048) ***

*** $p < 0.001$ (statistically significant at the 0.1% level)

Table A7. Estimates of covariances among exogenous variables in Model 1.

Covariance	Model 1c (Consistency)	Model 1a (Adaptation)	Model 1t (Transformation)
Strategy ↔ Employees	2.085 (0.288) ***	2.669 (0.348) ***	2.410 (0.313) ***
Employees ↔ Processes	2.429 (0.317) ***	2.844 (0.366) ***	3.595 (0.433) ***
Strategy ↔ Processes	3.492 (0.416) ***	3.729 (0.442) ***	3.497 (0.445) ***

*** $p < 0.001$ (statistically significant at the 0.1% level)

Appendix D

Table A8. Model 2 fit statistics.

Fit Index	Description	Acceptable/Good Guidelines	Model 2c (Consistency)	Model 2a (Adaptation)	Model 2t (Transformation)
Chi-Square (χ^2) Test	Tests difference between observed and model-estimated covariance matrices.	Non-significant χ^2 ($p > 0.05$) indicates acceptable fit, but sensitive to sample size.	$\chi^2(25) = 131.745$, $p < 0.001$ (Significant)	$\chi^2(25) = 57.644$, $p < 0.001$ (Significant)	$\chi^2(25) = 63.436$, $p < 0.001$ (Significant)
Root Mean Square Error of Approximation (**RMSEA**)	Evaluates how well the model approximates the population data.	<0.05 = Close fit; 0.05–0.08 = Reasonable fit; >0.10 = Poor fit.	0.154 (Poor fit)	0.085 (Borderline/Reasonable)	0.093 (Borderline/Poor)
Comparative Fit Index (**CFI**)	Compares model fit to a baseline (independence) model.	≥0.95 often indicates good fit.	0.944 (Borderline)	0.985 (Excellent)	0.981 (Excellent)
Tucker–Lewis Index (**TLI**)/Non-Normed Fit Index (**NNFI**)	Adjusts χ^2 for model complexity, comparing target and null models.	≥0.90 acceptable; ≥0.95 preferred for good fit.	0.919 (Acceptable)	0.979 (Excellent)	0.972 (Excellent)
Goodness-of-Fit Index (**GFI**) and Adjusted GFI (**AGFI**)	Reflect amount of variance explained by the model; AGFI adjusts for complexity.	Historically ≥ 0.90 acceptable but less used today.	GFI = 0.857, AGFI = 0.743 (Below desired)	GFI = 0.935, AGFI = 0.884 (Acceptable)	GFI = 0.928, AGFI = 0.870 (Borderline)
Normed Fit Index (**NFI**) and Incremental Fit Index (**IFI**)	Compare model to null model; IFI adjusts for sample size.	≥0.90 acceptable, higher is better.	NFI = 0.932, IFI = 0.944 (Good)	NFI = 0.975, IFI = 0.986 (Excellent)	NFI = 0.969, IFI = 0.981 (Excellent)
Overall Interpretation	Summary of fit indices		Poor overall fit High RMSEA, GFI/AGFI below 0.90; incremental indices borderline.	Best overall fit RMSEA borderline but acceptable; excellent incremental indices.	Good incremental fit RMSEA borderline, not as strong as 2a but better than 2c.

Table A9. Model 2 estimates of regression weights.

Regression Path	Estimate (S.E.)		
	Model 2c (Consistency)	**Model 2a (Adaptation)**	**Model 2t (Transformation)**
Employees ← Strategy	0.637 (0.054) ***	0.748 (0.057) ***	0.924 (0.069) ***
Processes ← Employees	1.549 (0.118) ***	1.341 (0.097) ***	1.421 (0.082) ***

*** $p < 0.001$ (statistically significant at the 0.1% level)

Appendix E

Table A10. Model 3 fit statistics.

Fit Index	Description	Acceptable/Good Guidelines	Model 3	Model 3m
Chi-Square (χ^2) Test	Tests difference between observed and model-estimated covariance matrices.	Non-significant χ^2 ($p > 0.05$) indicates acceptable fit, but sensitive to sample size.	$\chi^2(312) = 1023.871$, $p < 0.001$ (Significant)	$\chi^2(309) = 945.325$, $p < 0.001$ (Significant)
Root Mean Square Error of Approximation (**RMSEA**)	Evaluates how well the model approximates the population data.	<0.05 = Close; 0.05–0.08 = Reasonable; >0.10 = Poor	0.113 (Poor)	0.107 (Poor, slight improvement)
Comparative Fit Index (**CFI**)	Compares model fit to a baseline (independence) model.	≥0.95 = Good fit	0.904 (Borderline)	0.914 (Closer, but still <0.95)
Tucker–Lewis Index (**TLI**)/Non-Normed Fit Index (**NNFI**)	Adjusts χ^2 for complexity; compares target and null models.	≥0.90 acceptable; ≥0.95 good	0.892 (Below acceptable)	0.902 (Just reached acceptable level)
Goodness-of-Fit Index (**GFI**) and Adjusted GFI (**AGFI**)	Reflects variance explained; AGFI adjusts for complexity.	Historically ≥0.90 acceptable	GFI = 0.696, AGFI = 0.632 (Low)	GFI = 0.718, AGFI = 0.656 (Low)
Normed Fit Index (**NFI**) and Incremental Fit Index (**IFI**)	Compare model to null; IFI adjusts for sample size.	≥0.90 acceptable, higher is better	NFI = 0.868, IFI = 0.904 (NFI < 0.90; IFI borderline)	NFI = 0.878, IFI = 0.915 (NFI < 0.90; IFI borderline)
Overall Interpretation	Summary of fit indices		Poor-to-borderline fit (RMSEA high, low GFI/AGFI)	Poor-to-borderline fit (Further slight improvements in TLI/CFI, RMSEA still poor)

Table A11. Model 3 estimates of regression weights.

Regression Path	**Estimate (S.E.)**		
Digital governance maturity level →	**Consistency**	**Adaptation**	**Transformation**
Employees ← Strategy	0.653 (0.054) ***	0.596 (0.070) ***	0.481 (0.101) ***
Processes ← Employees	1.610 (0.120) ***	0.929 (0.110) ***	0.699 (0.130) ***
Dimension →	**Strategy**	**Employee**	**Processes**
Adaptation ← Consistency	0.970 (0.060) ***	0.226 (0.092) **	0.330 (0.070) ***
Transformation ← Adaptation	0.794 (0.054) ***	0.534 (0.110) ***	0.587 (0.101) ***

*** $p < 0.001$ (statistically significant at the 0.1% level), i.e. ** $p < 0.05$ (statistically significant at the 5% level)

Table A12. Model 3m estimates of regression weights.

Regression Path	**Estimate (S.E.)**		
Digital governance maturity level→	**Consistency**	**Adaptation**	**Transformation**
Strategy ← Employees	1.333 (0.122) ***	1.007 (0.100) ***	0.298 (0.088) ***
Processes ← Employees	0.962 (0.129) ***	0.748 (0.180) ***	0.495 (0.149) ***
Processes ← Strategy	0.457 (0.075) ***	0.279 (0.141) **	0.202 (0.164)
Dimension→	**Strategy**	**Employee**	**Processes**
Adaptation ← Consistency	0.237 (0.062) ***	1.146 (0.111) ***	0.191 (0.083) **
Transformation ← Adaptation	0.561 (0.079) ***	1.017 (0.079) ***	0.593 (0.125) ***

*** $p < 0.001$ (statistically significant at the 0.1% level), i.e. ** $p < 0.05$ (statistically significant at the 5% level)

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