Article

Decoding the Digital Landscape: An Empirically Validated Model for Assessing Digitalisation across Public Administration Levels

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Abstract: This research advances the field of digital government by developing and empirically validating a model for measuring the digital state of public administration, with a specific focus on Slovenia. Moving beyond traditional digital maturity models, our study introduces a holistic framework that integrates elements of technology, process, structure, people and organisational culture, enriched by dimensions of digital principles, good governance, and external environmental factors. This framework is grounded in an adaptation of Leavitt's diamond model, tailored to capture the nuances of digitalisation in public administration. The empirical validation is conducted through a comprehensive questionnaire administered to Slovenian public administration organisations at both local and state levels. The results provide a nuanced understanding of the current digital state that extends beyond technological aspects, including process optimisation, organisational structure, people elements and culture dynamics, and insights into internal and external barriers to digitalisation as well as principles of good governance and digitalisation. The study's results show that ministries in Slovenia generally possess a more advanced digital infrastructure than municipalities, particularly in various aspects of ICT development and integration. While Slovenia aspires to align with the EU digital strategy, it faces various challenges, particularly at the municipal level, in achieving coherent development of digital skills and policy implementation. The comprehensive approach allows for a more informed evaluation of digital transformation efforts, offering insights into areas of strength and opportunities for further development. The findings have significant implications for policymakers and stakeholders, highlighting critical areas for targeted improvement and strategic planning in the digitalisation of public administration.

Keywords: theoretical framework; digitalisation measurement model; public administration; public organisation; Leavitt's diamond model

1. Introduction

In contemporary discourse, digitalisation emerges as a pivotal catalyst driving transformations across social, economic, and political spheres (Frach et al. 2017). Its impact is also notable in public administration (PA), where it is heralded as a cornerstone for revolutionising public management practices. This phenomenon is encapsulated in concepts like digital-era governance (Margetts and Dunleavy 2013) and e-government (Heidelberg 2009; Dobrolyubova 2021), underscoring digitalisation's role in reshaping public sector management. Globally, the digitalisation of public administration, extending to the broader public sector, represents a significant policy evolution. The European Union exemplifies this trend with its strategic focus on digitalisation. The European Commission (2016) has been instrumental in formulating a unified approach, fostering alignment of digital strategies at national and local levels. Contrasting with the New Public Management (NPM) doctrines that exacerbated fragmentation within the public sector (Hood 1991; Pollitt and Bouckaert 2011; Aristovnik et al. 2022a), digital initiatives offer a pathway to enhanced integration

and coordination. Digitalisation has been identified as a key driver for improving internal coherence and fostering better coordination in public administration (Ansell and Miura 2020; Di Giulio and Vecchi 2023).

In Slovenia, a country navigating its digital transformation, these global trends resonate with unique regional characteristics. While striving to align with the European Commission's digital strategy, Slovenia faces specific challenges in terms of policy coherence and the development of digital skills, particularly at the local municipal level. This context in Slovenia underscores the need for a nuanced understanding of digitalisation in public administration that accounts for regional variations.

In the realm of digitalisation, public administrations are not merely facilitators and regulators of the private sector's digitalisation; they are also direct participants in the digital arena. This involvement necessitates the transformation of their operational processes and the digitalisation of public services. To harness the full potential of digitalisation, public administrations need to be well-informed about their current digital status (Frach et al. 2017). "You can only manage what you measure" (Falk et al. 2017) is particularly relevant here. Awareness of the digital status quo enables PAs to track their progress, pinpoint improvement areas, and benchmark their performance against comparable organisations. This knowledge fosters the exchange of effective practices and allows for monitoring ongoing changes. Crucially, it also equips PAs to devise and implement robust strategies for future digital advancements, ensuring continuous improvement in their digital journey.

To fully grasp the digital progression within public administration, a shift in focus is required from national-level analyses to an in-depth examination at the organisational level (Mergel et al. 2019). Country-wide comparative studies like the DESI (Digital Economy and Society Index) by the European Commission (Digital Economy and Society Index (Digital Economy and Society Index (DESI) 2023)), the OECD's Digital Government Index (DGI) (OECD 2023), and the United Nations' e-Government Development Index (EGDI) (United Nations 2023) provide valuable insights into the national performance, development, and competitiveness of countries and governments at the national level, leading to significant policy recommendations for policymakers. However, individual public organisations are the key to digital progress (Frach et al. 2017). Since 1999, e-government research has been an important stream in developing various ICT maturity models (Meyerhoff Nielsen 2017). According to Chanias and Hess (2016), digital maturity reflects a company's digital transformation progress, encompassing both operational changes and acquired transformation mastery capabilities. Recently, there has been a surge in the creation of digital maturity models (DMMs) due to the high practical relevance of the digitalisation topic (Thordsen et al. 2020). Nevertheless, maturity models have faced criticism for their linear structure and excessive focus on technology, often overlooking other vital organisational factors (Normann et al. 2020; Tangi et al. 2022).

This critique and research gap inspired the development of a more holistic model that considers a broad range of organisational elements involved in digital progress, including principles of good governance and digitalisation specific to public administration. Hence, this study is driven by the purpose of critically examining and understanding the complexities of digital progression within public organisations. Specifically, it seeks to address the gap in the existing literature regarding comprehensive assessments of digitalisation, highlighting the need for a model that transcends traditional digital maturity metrics by incorporating broader organisational elements. This purpose is grounded in the imperative to enhance strategic planning and operational efficiency in public administrations through a more nuanced understanding of digital progress. To achieve this, our study sets forth the following objectives. First, to develop a holistic model that measures the digitalisation state of public organisations at both ministry and municipal levels, integrating operational changes, transformation mastery capabilities, and digital and good governance principles. The second objective is to empirically validate this model through rigorous testing and comparative analysis, ensuring its applicability and effectiveness in identifying areas for improvement and benchmarking digital progress. Through these objectives, our research

endeavours to provide actionable insights that facilitate the advancement of digitalisation strategies within public organisations, thereby contributing to the broader discourse on digital transformation in public administration.

The sections are structured as follows. Section 2 presents the theoretical background of maturity models, their critics, and the rationale for focusing on organisations. Section 3 outlines the framework upon which the digitalisation measurement model for a public organisation is based. In Section 4, we describe the empirical testing of the model using an extensive questionnaire prepared for heads of public organisations and informatics departments (where applicable). This section also covers the data selection methods, including a detailed description of the research process and measurements. Section 5 presents the research results and discussion. Finally, the last section concludes the study, combining all the findings.

2. Theoretical Background

Public organisations, primarily those tasked with managing interactions with citizens and taking care of their needs, are increasingly seeking digital development to meet evolving expectations within the constraints of their budgets. As such, organisations should be central to any digitalisation measurement efforts (Dobrolyubova 2021). It is crucial to understand that digitalising service delivery is not an isolated endeavour for public entities. Instead, it is intricately linked to broader internal digitalisation processes since digitalisation transcends mere technology adoption. It represents a comprehensive shift encompassing organisational strategies, business processes, organisational knowledge, and the overall socio-technical framework (Alsufyani and Gill 2022).

In the field of information systems, especially within digital government, understanding the developmental trajectory of technologies is crucial. This understanding aids in reconstructing the history of technology development and envisioning how new, disruptive technologies and forward-thinking services are revolutionising government functions through smart services (Lemke et al. 2020). Over the past few decades, practitioners and researchers have devised numerous models to facilitate this understanding. These models are known by various names, including maturity, benchmarking, stage, and adoption models (Normann et al. 2020). Since 1999, these models have been a foundational aspect of e-government research, offering frameworks to measure and guide the digital evolution of public administration organisations (Meyerhoff Nielsen 2017). They provide methodologies to classify and evaluate, for instance, the online service provision based on specific organisational and technical criteria (Normann et al. 2020). Among the most cited e-government maturity models are Layne and Lee's four-stage maturity model (Layne and Lee 2001), Fountain's technology adoption framework (Fountain 2004), and Davison et al.'s four-stage strategy and maturity model (Davison et al. 2005), along with others (Iribarren et al. 2008; Heeks 2015; Janowski 2015; Andersen and Henriksen 2006; Aristovnik et al. 2022b). These models have been crucial in academic research and in creating indices for international organisations to assess government digitalisation across different countries (Normann et al. 2020).

Maturity models, widely used in government digitalisation, face substantial criticism despite their popularity. Critics question the validity and utility of these models, raising concerns about the appropriateness of the stages defined, the actual progression through those stages, and whether higher stages are inherently superior to lower ones (Goldkuhl and Persson 2006). Furthermore, maturity models often suffer from a weak theoretical foundation, lack empirical support, and provide an inadequate basis for benchmarking (Normann et al. 2020). They tend to make broad generalisations about maturity, which are difficult to apply practically at different governmental levels. This is partly because many maturity models are not backed by solid theory or empirical evidence, challenging their ability to accurately predict developments in e-government (Biberoglu and Haddad 2002). Maturity models tend to be most beneficial in uncertain scenarios, particularly when technology is still emerging and has not achieved a dominant design (Normann et al.

2020). Contemporary models often overly focus on processes, neglecting other aspects like skillsets or technological affordances (Van Looy et al. 2017; Röglinger et al. 2012; Bach 1994). The linear progression implied in these models towards an ultimate stage is also being questioned for its validity (Normann et al. 2020).

Such criticisms highlight the need for a model that focuses on measuring the digital status quo, regardless of the digital stage, and integrates multiple organisational aspects such as structure, culture and people, additionally considering good public governance and digital principles (De Vries et al. 2016). This perspective is aligned with international frameworks and guidelines that have begun to emphasise accountability, efficiency, user-centeredness and transparency (United Nations 2022; OECD 2014; European Commission 2014).

Organisational digitalisation, which goes beyond mere IT investment to include the comprehensive integration of IT within an organisation, is a complex process. This complexity arises not only from investing in new IT infrastructure but also involves training employees, incorporating new IT functions, and actual usage of IT (Burton-Jones and Gallivan 2007). Digitalisation significantly impacts organisational aspects, including strategy, culture, structure, business processes, and knowledge, triggered by implementing new IT solutions (Bharadwaj et al. 2013; Orlikowski 2010; Park and Saraf 2016). Moreover, the success of adopting IT is also contingent upon public managers' comprehension of how the adopted technology will impact the organisation. In an era of rapid technological advancement and increasingly complex and dynamic environments, organisations are compelled to adopt a more flexible and adaptive approach. This underscores the pivotal role of technology as a catalyst for change and highlights the significance of continuous learning and adaptation within organisations (Di Giulio and Vecchi 2023).

In response to these criticisms and research gaps, developing the present model for measuring the digital status quo followed a path of considering the basic organisational model. Hence, the model draws on Leavitt's diamond model (Leavitt 1965) to offer a comprehensive approach that includes all the key organisational elements, additionally incorporating good governance and digital principles and factors from the external environment.

3. Developing a Model for Measuring the Digital State in Public Administration Organisations

In modern public administration, Information and Communication Technologies (ICTs) and information systems are key to enhancing efficiency and service delivery. They streamline administrative processes and offer accessible services through e-government platforms. These systems aid in data management and analytics, essential for evidence-based policymaking (Homburg 2018). ICTs also promote transparency and accountability, improving internal and external communication (Bertot et al. 2010), and are crucial in remote work facilitation and crisis management. Additionally, they ensure legal compliance, foster public participation in governance, and act as catalysts for innovation in policy and administration. Overall, ICTs are integral to modernising and improving governance, making it more responsive and citizen-centric (Eom and Lee 2022; Wilson and Mergel 2022).

The increasing reliance on and integration of ICTs within organisational frameworks underscore a critical management issue: aligning ICT with fundamental organisational components, including organisational structure, personnel, tasks, management processes, strategies, and pre-existing technologies. Organisations must meticulously tailor their structures, processes, human resources, cultural dynamics, and management practices to effectively synergise with technological advancements to harness the potential of ICT investments fully. Wigand (2007) reinforces this viewpoint, advocating for a strategic adjustment of organisational facets to optimise outcomes derived from technology.

In developing a model for assessing the digital state of public administration organisations, we draw inspiration from Leavitt's diamond model (1965). Initially devised by Harold J. Leavitt in 1965, this framework serves as a cornerstone for understanding the dynamics of organisational change, particularly in the context of private organisations. Leavitt posited that an organisation comprises four key interdependent elements: tasks, people,

structure, and technology. His model, often referred to as Leavitt's Alignment Model or Leavitt's System Model, emphasises the symbiotic relationship among these components, asserting that one modification inevitably precipitates adjustments in the others.

In our adaptation of Leavitt's model for the digital realm of public administration, we retain the core elements of processes, people, structure, culture and technology yet diverge in terms of application. Unlike the original model, which focuses on change management and the ripple effects of alterations in any single component, our model aims to measure the current digital state of these elements. It is a diagnostic tool designed to assess the status quo of digitalisation within an organisation, considering how these components collectively contribute to its digital maturity.

In Leavitt's model, technology is seen as a pivotal force, directly impacting the nature of tasks, the roles and skills of employees, and the organisation's structure. For instance, introducing new technology may necessitate a shift in employee skills and potentially lead to changes in organisational hierarchy and workflow. The model underscores the significance of a balanced and comprehensive view of these elements, particularly in the domain of knowledge management, where each component is deemed equally vital. To elucidate further, structure refers to the organisational layout, encompassing the hierarchical arrangement and the interaction, communication, and coordination across different levels and departments. It is a dynamic component that adapts in response to changes in other areas of the model. Tasks are the specific activities and responsibilities undertaken by teams and individuals within the organisation. The model highlights the importance of understanding these tasks, especially when organisational changes are anticipated or implemented. The people element focuses on the workforce—their skills, attitudes, and behaviours—and how these attributes are brought to bear in their roles. The model emphasises the need to align these human factors with the evolving demands of the organisation. Central to Leavitt's model, technology encompasses the tools and systems employed by the organisation to facilitate and execute tasks (Grant and Mergen 1996; Smith et al. 1992; Wigand 2007).

In our model for measuring the digital state, we apply these elements to evaluate the current level of digitalisation in public administration. Our goal is not to track change per se but to gauge the existing digital ecosystem, providing a snapshot of an organisation's digital journey. This approach allows us to create a nuanced understanding of digital maturity, considering the interplay and balance of these fundamental elements. By doing so, we can identify areas of strength and opportunities for enhancement in the digital infrastructure of public administration organisations.

Leavitt's diamond model was later extended by other authors (Burke and Peppard 1995; Kovačič et al. 2004). Organisational culture was added as a fifth element, and the element "task" was changed to "processes". These key elements of the organisation are interdependent. Changes in one cause changes in the other (Nograšek and Vintar 2014). Additionally, according to the theory of technological determinism, ICT directs the transformation of public administration organisations, which means that technology causes changes in processes, structure, people and organisational culture. Through the socio-technical theory, however, ICT is only one of the equal components of the socio-technical system, and as long as processes, people, culture, and structure remain unchanged, the potential of modern technologies cannot be fully exploited (Lazer 2002; Maniatopoulos 2005; Nograšek and Vintar 2014).

Nograšek and Vintar (2014) further proposed an additional view that allows for a combination of the mentioned perspectives, namely: (1) ICT is an important tool and key promoter of organisational transformation and (2) the potential of ICT is inter-connected and depends on the development and readiness of all the other key elements of an organisation (processes, people, structure, culture). ICT thus represents an equivalent element of the socio-technical system and is the foundation of our model for measuring the state of digitalisation in public administration organisations (Figure 1).
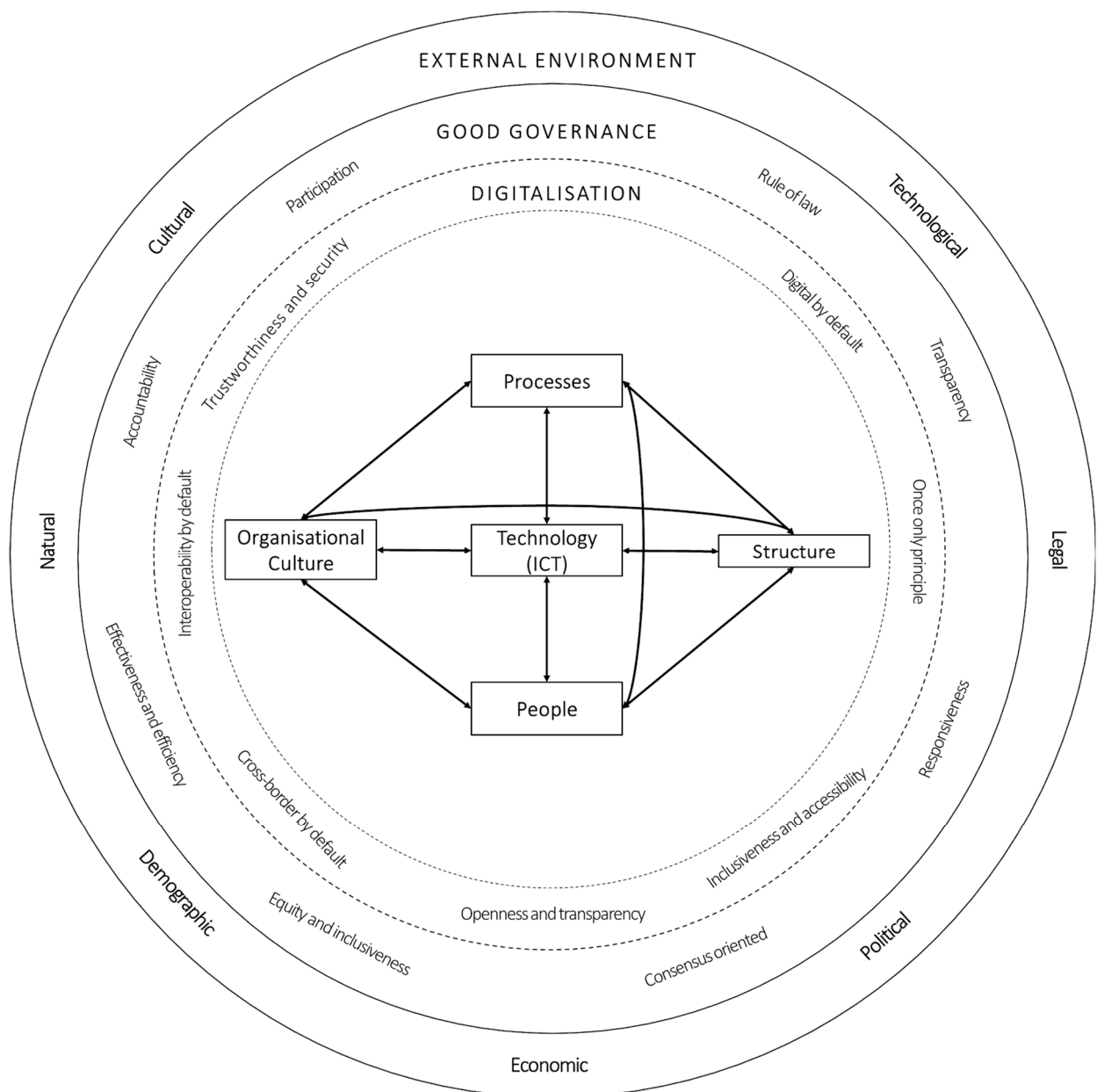
Figure 1. A model for measuring the digital state at the organisation level. (Sources: Aristovnik et al. 2022b; Burke and Peppard 1995; European Commission 2016; Kovačič et al. 2004; Leavitt 1965; Nograšek and Vintar 2014; OECD 2004; Rainey 2009; United Nations 2022).

Building on this foundation, the model is further enriched by integrating three additional dimensions, each vital to comprehensively understanding the digital state in public administration: (1) Digital Principles, (2) Good Governance Principles, and (3) External Environment Factors. These dimensions are incorporated to reflect the broader context in which public administration operates, encompassing both internal operations and external influences.

(1)   The European Commission's eGovernment Action Plans are political tools for advancing the modernisation of public administrations across the European Union (European Commission 2016). All citizens and businesses in the European Union should have access to efficient and inclusive, borderless, personalised, user-friendly, end-to-end digital public services provided by public administration and public institutions in the EU. Each Action Plan integrates essential principles, encompassing user-centricity

for easy-to-use, digital-first public services, alongside trustworthy and secure handling of personal data. It emphasises inclusivity and accessibility for diverse user groups, including multi-lingual and disability considerations. Interoperability across EU borders and devices is prioritised, along with openness and transparency in government processes, promoting stakeholder engagement and accountability. An innovation culture is encouraged, with public sectors adopting new technologies and collaborative approaches. Additionally, the plan stresses the importance of respecting data, cyber, and IT security as being foundational for digital service adoption and trust enhancement.

(2)   The concept of good governance, central to social coordination theories, has evolved through interdisciplinary application and policy analysis, emphasising a shift from traditional state-administered monopolistic hierarchies to a well-functioning bureaucratic system that includes various societal networks for enhanced coordination (Kovač et al. 2016; Bevir 2011; Peters 2012; Aristovnik et al. 2022a). This approach is anchored in eight key principles: rule of law, participation, consensus orientation, equity, inclusiveness, transparency, responsiveness, efficiency, and effectiveness (OECD 2004). These principles represent a European interpretation of good governance, distinguishing themselves from traditional models by advocating for administrative openness to society and citizens. This openness, manifesting in transparent actions and citizen accountability, is seen as essential for effectively achieving public objectives (Bileišis et al. 2017).

(3)   In public administration, understanding and adapting to various environmental factors is crucial for effective and good governance. Legal aspects provide the regulatory framework, guiding operations within the bounds of law. Economic factors influence resource allocation and fiscal policies, which are essential for sustainable service delivery. Demographic shifts dictate the evolving needs and diversity of the population served. Political climates shape policy priorities and administrative strategies. Natural environmental considerations, such as climate change and resource management, are vital for sustainable development and disaster response planning. Cultural factors impact how public services are perceived and received, necessitating culturally sensitive approaches. Lastly, technological advancements present both opportunities and challenges, driving innovation in service delivery while requiring adaptability to fast-paced changes. Collectively, these elements shape the efficiency, relevance, and effectiveness of public administration in serving and responding to the needs of society (Barcevičius et al. 2019; Rainey 2009).

4. Digital Public Administration in Slovenia: Knowledge So Far

Before delving into the results of our research, let us first briefly present the existing knowledge on the digital landscape within Slovenian public administration. This background will provide a context for the outcomes of a questionnaire aimed at assessing the digital status quo at both the ministerial and municipal levels in Slovenia.

Slovenia has undergone significant shifts in its political leadership, which have notably impacted policy priorities in the realm of digital government. This fluidity in policy orientation challenges establishing stable and coherent policies, particularly in critical areas such as interoperability, digital identity, and service design and delivery. Despite these challenges, Slovenia's Ministry of Digital Transformation (MDT) plays a pivotal role in coordinating digital government policies across various sectors. The MDT's efforts are essential for fostering cross-sector and cross-level coordination, ensuring alignment with the central digital government strategy (Digitalna Slovenija 2023).

The legalistic institutional culture in Slovenia, characterised by a heavy reliance on detailed laws and regulations, tends to ensure consistency in policy implementation. However, this approach might also hinder agile policymaking and impede the swift progression of digital transformation. A survey conducted by the OECD in 2020 highlighted a lack of motivation among public servants to improve their digital skills, suggesting a misalign-

ment of the perceived value of digital competencies. In response, the Ministry of Public Administration, through the Administration Academy, has initiated training programmes to enhance digital literacy among civil servants. These programmes emphasise areas such as data science, business intelligence, and open data management (OECD 2021).

Since 1993, Slovenia has functioned as a decentralised unitary state, granting significant autonomy to its 212 municipalities. However, this decentralisation is contrasted by a relatively centralised administration compared to other OECD countries. In Slovenia's small and homogeneous territory, this centralisation could be advantageous for implementing coherent digital policies. Nonetheless, balancing this with keen attention to local specificities is crucial to avoid fragmented policy approaches (OECD 2021).

The COVID-19 pandemic has acted as a catalyst for accelerating digital transformation within Slovenia. Public institutions have shown varied responses, with some rapidly digitising services while others lagged, thus highlighting disparities in digital service provision across the country. The European Commission's Digital Economy and Society Index (Digital Economy and Society Index 2021) ranked Slovenia 13th among EU countries in overall digital progress but also noted significant gaps in digital public services, particularly at the local level (OECD 2021).

With these observations in mind, we can formulate certain expectations for the outcomes of our questionnaire focused on the digital status quo of public administration in Slovenia. We anticipate that ministries will demonstrate a higher level of digital maturity compared to municipalities, primarily due to the centralised nature of Slovenia's administration and the leading role of the MDT. Additionally, digital skills and competencies will likely be more advanced at the ministry level, influenced by initiatives such as the Administration Academy's training programmes. Conversely, municipalities, especially the smaller ones, might face financial constraints that impact their digital development. These constraints could result in a lack of resources for digital infrastructure and training, leading to varied levels of digital implementation across municipalities. Based on Slovenia's performance in the DESI and the need for improvement in digital public services at the local level, the questionnaire is expected to underscore the potential for and importance of enhancing digital services in municipalities.

This section sets the stage for a deeper understanding of the results obtained from the questionnaire, providing a critical backdrop for interpreting the data in the context of Slovenia's unique digital landscape.

5. Results and Discussion

In exploring the digital landscape of Slovenia's public administration, the data from ministries and municipalities reveal a multifaceted picture of progress, challenges, and varying levels of digital integration and competence. Drawing on specific questionnaire responses, this analysis aims to provide a variety of insights that the model captures and a nuanced understanding of where both ministries and municipalities in Slovenia stand in their digital journey and the underlying factors that contribute to these differences.

In a comparative analysis of technological aspects, ministries exhibit a more advanced digital infrastructure than municipalities, particularly in terms of ICT integration and information security, though the differences are not statistically significant. While ministries demonstrate robust information security frameworks and user-centric digital channels, municipalities show greater variability in these areas, indicating a less developed digital infrastructure. Both entities display a diverse approach to open data policies, but ministries generally have a stronger emphasis on digital skills development.

In examining the process-related dimensions of public institutions, our analysis has elucidated certain patterns that, while not statistically significant, denote tendencies worth noting. Ministries display a tendency towards more consistent process optimisation and digitalisation. This is evidenced by the relatively high mean scores, suggesting that ministries are actively engaging in streamlining and enhancing their processes. The range of scores within the ministry group also points to an established yet varied level of digitali-

sation in process management. Municipalities, conversely, present a broader spectrum of process optimisation, with average scores marginally lower than those of ministries. This variability implies that while some municipalities are making notable strides in process improvement, others may be in the earlier stages of this transformation.

The analysis delineates subtle variances in their operational frameworks regarding the organisational structure element of ministries and municipalities. Ministries, as the data suggest, have reported higher average scores regarding the effectiveness and adaptability of their organisational structures, hinting at a more evolved internal configuration that is attuned to their operational demands. This is contrasted by indications of a less pronounced focus on hierarchical flexibility and cross-departmental collaboration, where the mean scores dip and signal potential for further refinement to enhance the overall organisational dynamism. While presenting competent scores on the scale of organisational effectiveness, municipalities show a pronounced variability in responses, reflecting a landscape of organisational practices ranging from nascent to well-established. Echoing the pattern observed in ministries, municipalities also reveal a need for bolstering organisational flexibility and nurturing a more collaborative cross-functional environment, as evidenced by their lower scores in these domains.

In comparing both types of institutions, ministries appear to have a slight advantage in the effectiveness of their people-related element. Nonetheless, both ministries and municipalities show a clear avenue for growth in developing organisational cultures that promote adaptability and inter-departmental cooperation. Lastly, ministries demonstrate relatively high scores in areas assessing the strength and adaptability of their organisational culture, indicating a well-established cultural environment. There are potential areas for improvement in promoting a culture of innovation and flexibility, as seen in the slightly lower mean scores for certain aspects. Overall, the data suggest a strong yet somewhat traditional organisational culture within ministries, with opportunities identified for fostering a more innovative and adaptive cultural landscape. Municipalities also score well on questions related to organisational culture, but with a wider range of responses, indicative of diverse cultural practices across different municipalities. Like ministries, municipalities show a strong base in their organisational culture, with room for growth in innovation, adaptability, and cross-functional collaboration. The variability in the scores suggests a range of cultural maturity among municipalities, from well-established to those needing further development to nurture a more dynamic and adaptive culture.

5.1. Differences between the Public Administration Levels

Based on the provided data, this comprehensive analysis highlights the nuances of digital development in the Slovenian public administration case, offering a foundation for targeted policy interventions and strategic planning to bridge gaps and leverage digital opportunities for enhanced public service delivery and governance. Following the general overview, the first part of the results shows statistically significant differences between local and national levels for certain organisational elements in our model. The most differences were found at the technological level.

Starting with the interoperability between public IT systems, the ministries reported higher technical integration between their ICT solutions and other PA institutions' ICT solutions than municipalities. For example, IT systems such as tax authority, land cadastre, company register, etc., primarily designed as closed systems and operate with different access codes than the general platform of digital public services, are not satisfactory in general and need improvement of their connectivity. When it comes to the use of intelligent document processing, such as Artificial Intelligence, the results were very low for both levels. There is currently inadequate capacity for integrating AI into the wider public sector and business landscape in Slovenia. There is a lack of standards for the development, deployment and use of AI, a lack of standards and good procurement practices for innovative AI-based solutions, and fragmented and inconsistent infrastructure for the development

and implementation of AI across various sectors (NpUI 2020). Hence, such results were not surprising.

For the data analytics system, the anticipation for municipalities, in general, was low because a Business Intelligence System called Chest is currently available as a service for government agencies. The Chest system enables interactive insight into real-time data and forecasting analytics, which are entirely new dimensions for public administration. The Ministry for Digital Transformation is responsible for maintaining this system, and they keep introducing new data that are important for obtaining key information for effective state management (National Informatics Office (NIO) (2023)). Municipalities are not (yet) among the rightful beneficiaries of the Chest system. On the other hand, considering the current results (ministries: median 3, municipalities: 1), this might be understandable due to several different reasons connected to other issues regarding the digitalisation of municipalities. First of all, a lot of data are still not digitised by local governments, regardless of the size. Most of the municipalities are, for certain operations, still operating and saving data analogously. Secondly, the digitised data are not cleaned and prepared for further analysis or stored in a unified database. The data are scattered inside a single municipality, let alone on the central level of all 212 local governments. Furthermore, the interviewees highlighted an additional important barrier: weak digital skills for operating with data analytics and a lack of possibility of hiring IT specialists. ICT solutions are outsourced, with each municipality dealing with this area independently. Additionally, due to the small size of certain municipalities and low number of citizens, and hence the lower operation flow, the need for data analytics was not yet detected.

When collecting user feedback (suggestions/initiatives, complaints, compliments), the most frequently established digital channel was e-mail for both levels, with a statistically higher frequency for municipalities (5.00 vs. 4.50). The special web application is evenly established for both levels, and social media as well, with a slightly higher frequency for municipalities, yet the difference is not significant. According to the respondents, Facebook is the most common type of social media and is also used for public relations.

When designing new ICT solutions, ministries consider the recommendations of relevant external stakeholders (users, researchers and policy-makers) significantly more than municipalities. Policymakers (4.00) and users (4.00) are considered more frequently than researchers (3.00) in ministries' design of new ICT solutions, and users (3.00) and policymakers (3.00) more than researchers (2.00) in municipalities' design. Representatives of NGOs are least frequently considered at both levels when designing new ICT solutions. Overall, the willingness to accept external stakeholders' involvement in designing new ICT solutions is not problematic, but the capacity to achieve this in practice throughout the public administration is. The Digital Government Review of Slovenia, a study by the OECD (2021), found similar conclusions regarding the user-driven approach in the Slovenian government. Concerning the high scores for the user-driven indicator in the DGI index (OECD 2020); their review also found that most organisations were not actively engaging external stakeholders. Additionally, those organisations that were, used ways that were not always user-driven, such as workshops with others, and also private sector suppliers for consensus-building (Ibid.).

In examining the organisational element "Processes" within our study, we observed substantial disparities anchored in two interrelated assertions. The documentation of business processes, encompassing process diagrams, emerges as a critical stipulation of quality frameworks such as the CAF (Common Assessment Framework) or ISO 9000. Several municipalities maintain certifications under these quality models and adhere to their documentation standards, including business process documentation. Conversely, non-certified municipalities, despite fulfilling legal obligations for documentation, often lack comprehensive process diagrams, a shortfall particularly noticeable in smaller municipalities. In contrast, ministries, though generally not adhering to the CAF or ISO 9000 certifications, have established practices for documenting business processes, including diagrams.

Lastly, within the "People" element of our analysis, marked variances were noted in the stratification of human resource systems. This segmentation is primarily legally driven, given the statutory budget constraints imposed on hiring new personnel, notably in the informatics domain. The public sector grapples with a scarcity of IT specialists, a situation exacerbated by its inability to offer competitive salaries relative to the private sector. This challenge is more pronounced at the local level, with numerous municipalities operating devoid of IT staff. This is particularly true in smaller municipalities (e.g., those with six or fewer employees), where the demand for IT expertise is relatively minimal. This scenario mirrors the constraints faced in data analytics; both phenomena are intertwined and reflective of broader systemic issues within the public sector.

Table 1 presents data from the questionnaire items, where there were statistically significant differences between ministries and municipal administrations. Predominantly, the responses concerning various facets of digitalisation indicated more advanced implementation in ministries than local governments. However, it is important to note that the limited sample scope might influence these findings. The sample encompasses 30 of 212 Slovenian municipalities and 10 of the 14 ministries. This limitation should be considered when interpreting the results.

Table 1. Comparative analysis of digitalisation in ministries and municipalities.

	Ministries' Median and Mean Rank	Municipalities' Median and Mean Rank	U-Statistic	*p*-Values	Effect SIZE (r)
TECHNOLOGY					
The ICT solutions we use are technically integrated with the ICT solutions of other public administration institutions.	4 28.78	2 17.37	56	0.005	−0.439
We use intelligent document processing (artificial intelligence, i.e., smart automation).	1.5 26.55	1 17.74	79.5	0.002	−0.498
We have established a data analytics system supported by modern IT.	3 28.90	1 16.93	56	0.001	−0.529
We have established e-mail for collecting feedback (suggestions/initiatives, complaints, compliments) from our users.	4.5 14.75	5 21.02	92.5	0.033	−0.337
When designing new ICT solutions, we consider the recommendations of users.	4 24.05	3 16.96	80	0.046	−0.316
When designing new ICT solutions, we consider the recommendations of researchers.	3 24.85	2 16.06	66.5	0.021	−0.364
When designing new ICT solutions, we consider the recommendations of policymakers.	4 27.94	3 15.35	36.5	0.001	−0.505
In addition to the official language, our website is also available in English.	4 27.65	3 17.36	68.5	0.011	−0.403
Citizens of other countries can communicate with us via video conferencing.	3 26.67	1 16.54	57	0.010	−0.408
Citizens of other countries can communicate with us through talking robots.	1 22.00	1 17.05	84	0.007	−0.424
PROCESSES					
We have documented business processes in our institution, including process diagrams.	4 24.50	3 16.50	67.5	0.043	−0.320
We operate in accordance with certificates and/or quality/excellence models (CAF, EFQM, ISO 9000)	1 12.05	2 21.57	65.5	0.003	−0.463
PEOPLE					
Our institution has a system in place to reward existing staff in the field of informatics.	4 23.17	1 15.46	61.5	0.031	−0.341
Our institution has a system in place to attract new staff in the field of informatics.	3 22.83	1 14.81	55.5	0.011	−0.401

Note: Only statistically significant results are presented, *p* < 0.05. Aspects related to organisational culture and structure did not yield statistically significant outcomes and are therefore not included. Data are derived from our study conducted in 2022 and 2023; see the Materials and Methods section (Section 6) for the detailed data collection procedures.

5.2. Analysis of Internal and External Barriers to Digitalisation

Our study also analysed the barriers to digitalisation, a pivotal factor in comprehensively assessing the current digital landscape and tracking progress and their correlations

with different organisational aspects. Understanding these obstacles is essential for evaluating effectiveness, ensuring accountability, identifying successful strategies, and learning from unsuccessful ones (Mergel et al. 2019).

Initially, our focus was on internal barriers impeding digital development. A detailed examination of the "high costs" barrier revealed a significant inverse relationship between cost perception and various organisational factors in municipalities. Municipalities viewing digitalisation costs as a barrier tend to underinvest in monitoring process execution time and quality. This trend suggests that budgetary limitations may restrict their capacity to enhance process efficiency and quality control. Furthermore, these fiscal constraints seem to extend to human resource management, as evidenced by a pronounced negative correlation with evaluating digital competencies among job candidates. Municipalities also demonstrate a decreased tendency to regard ICT investments as a means of boosting employee satisfaction, implying that financial concerns negatively impact their recognition of ICT's potential advantages. In contrast, our analysis of ministries did not indicate similar negative correlations.

Regarding "process interoperability," our findings indicate a significant negative correlation ($r = -0.538$) with advancements in reducing process execution time. This suggests that municipalities perceiving this barrier experience difficulties in accelerating process times. Moreover, these municipalities are less inclined to reassign tasks ($r = -0.353$) and employee responsibilities ($r = -0.437$) following ICT adoption, hinting at how interoperability issues can limit organisational restructuring. The study also found that challenges in "technological interoperability" hinder the redistribution of tasks and responsibilities, as shown by the negative correlations of $r = -0.379$ and $r = -0.372$, respectively. Additionally, these interoperability challenges correlate with a reduced belief in the ability of ICT to enhance employee satisfaction ($r = -0.448$) and hinder the widespread adoption of digitalisation initiatives among employees ($r = -0.342$).

Our research provides insightful correlations between human factors, organisational culture, and the success of digitalisation in municipalities and ministries. In municipalities, the perception of employees' inadequate digital skills ($r = -0.448$) correlates with diminished optimism about the benefits of ICT adoption for employee satisfaction. This perception also hampers the broader dissemination of successful digitalisation initiatives ($r = -0.342$). A particularly revealing aspect is the negative correlation ($r = -0.330$) between employees' resistance to change and the success of digitalisation initiatives spreading across the organisation. This indicates that employee apprehension towards digital changes significantly obstructs digital transformation efforts' comprehensive integration and adoption. Addressing this resistance through effective communication and targeted training is critical for successful digitalisation. Furthermore, a lack of interest among employees negatively impacts the redistribution of tasks ($r = -0.322$) and responsibilities ($r = -0.499$) in the wake of ICT adoption. This finding underscores the importance of fostering employee engagement and motivation in digital transformation.

In ministries, similar trends were observed. The perception of employees' deficient digital skills strongly correlates with reluctance to reassign tasks during ICT implementation ($r = -0.725$). Notably, a lack of employee interest is adversely linked with a data analytics system ($r = -0.647$) and a specialised web application for user feedback collection ($r = -0.734$). Additionally, ministries that recognise employees' limited digital skills ($r = -0.758$) and their resistance to change ($r = -0.944$) are less inclined to involve them in digitalisation. These findings highlight the significant role of human factors and organisational culture in the effectiveness of digitalisation efforts. They underscore the need for targeted strategies to address employees' skills, resistance to change, and engagement to ensure the successful implementation of digital transformation initiatives.

In our analysis of the external barriers to digital development, a critical issue identified is the inadequate digital skills among service users, a challenge particularly prevalent in municipalities. Specifically, directors of municipalities, particularly from rural areas, reported that citizens tend to visit facilities in person rather than using digital options.

This observation aligns with the Digital Economy and Society Index (2022) data, indicating that nearly half of Slovenia's working population grapples with insufficient digital skills. Notably, Slovenia ranked 11th among the 27 EU Member States in 2022. While Slovenia approaches the EU average in human capital with a score of 44.3, it lags in the percentage of the population with basic and above basic digital skills (50% and 20%, respectively, compared to the EU averages of 54% and 26%) (Digital Economy and Society Index 2022).

Further on, regarding the lack of strategic directions, responses from municipal administrations emphasised the absence of a systemic solution, advocating for standardised ICT solutions and clear strategic directions to streamline digitalisation efforts. This need for a more coherent strategy and technical standards is consistent with the OECD's Digital Government Review of Slovenia (OECD 2021), which similarly identified a desire for stronger leadership at the central government level in establishing a "service standard". Our analysis reveals a statistically significant negative correlation (−0.394) between the barrier "Lack of strategic directions" and "Employees' inclusion in the digitalisation process". This suggests that more precise and well-defined digitalisation strategies are integral to effectively engaging employees in digital transformation initiatives. At the ministry level, the absence of strategic direction is negatively correlated with the presence of a data analytics system supported by modern IT technologies, such as Online Analytical Processing (OLAP) and data mining ($r = −0.656$). This indicates that strategic planning can help increase the adoption and effective utilisation of advanced data analytics systems in digitalisation efforts.

Our data unveil a significant negative correlation between the "Insufficient financial support" barrier and several organisational aspects. For instance, as the financial constraints intensify (−0.347), the capacity of municipalities to measure process quality diminishes. Similarly, we found a significant negative correlation (−0.418) between insufficient financial resources and the municipalities' ability to measure process delivery costs. This indicates that financial limitations likely hinder comprehensive cost measurement as part of digital transformation efforts. Moreover, a strong negative correlation was found between insufficient financial resources and assessing the digital competencies of job candidates (−0.546), suggesting limited financial resources may curtail municipalities' ability to invest in thorough assessments of candidates' digital skills. Interestingly, for ministries, no significant correlations were found concerning insufficient financial support, indicating a variance in the impact of this barrier across different levels of government.

Regarding the external barrier of "insufficient internet use among service users", our study found it to be the least correlated with other factors for municipalities and ministries. Secondary data provide further insight into this finding. As of the first quarter of 2022, 93% of Slovenian households had internet access, and an average of 89% of individuals in Slovenia reported using the internet. Notably, 84% of the population uses the internet multiple times daily (Digitalna Slovenija 2023).

5.3. The Presence of Digital and Good Governance Principles

In the evolving landscape of public administration, implementing digital and good governance principles stands as a cornerstone for effective and efficient governance. The European Commission (2016) has emphasised the importance of these principles, advocating for their integration into the operational frameworks of public institutions. In the current study, data were additionally aggregated based on these principles to provide a holistic understanding of the digital transformation landscape in Slovenian public administration. By aggregating scores for individual questions tagged under these subprinciples, we could compute composite scores that reflect the extent to which these organisations embody the core elements of digitalisation. Preliminary analyses indicated varying levels of adoption and integration of these principles between municipalities and ministries. Such aggregated analyses offer a multi-dimensional view, enabling policymakers to identify specific areas of strength and opportunities for improvement in the digitalisation journey of public administration.

The principles under scrutiny are bifurcated into two categories: digital principles and good governance principles. Digital principles, including "Cross-border by default", "Openness and transparency", and the "Once only principle", fundamentally aim to enhance public entities' digital infrastructure and data management. Good governance principles, such as "Transparency" and "Rule of law", focus on the ethical, transparent, and lawful conduct of public administration.

For the municipalities, the dataset reveals nuanced insights into the state of digital transformation in Slovenian public administration, segmented by the overarching principles and their respective subprinciples. Under the principle of digitalisation, the subprinciple of "Cross-border by default" garnered a mean score of 2.05, indicative of limited cross-border initiatives, since municipalities rarely deal with citizens from other countries. On the other hand, "Cross-border by default" and "Openness and transparency" have higher mean scores for ministries (3.12 and 3.44, respectively) compared to municipalities (2.05 and 2.45, respectively). This suggests that ministries may have more robust digital infrastructures and policies, possibly due to greater resources or strategic prioritisation at a higher administrative level and operating across borders frequently. Similarly, the "Digital by default" subprinciple recorded a mean score of 2.61, suggesting moderate levels of digital adoption. However, "Inclusiveness and accessibility" received a higher mean score of 3.76, pointing to a favourable approach towards inclusive digital practices.

In the domain of good governance, similar trends are observed. The principle of "Transparency" has a notably higher mean score for ministries (4.05) than municipalities (3.26). This could imply a more ingrained culture of transparency at the ministerial level or possibly more stringent regulatory compliance requirements. The "Rule of law" principle also follows this pattern, albeit with a somewhat narrower gap.

The observed differences between municipalities and ministries in adhering to these principles warrant a nuanced understanding. Ministries, typically operating at a national level, may have better access to resources, expertise, and technology, enabling them to implement these principles more effectively. Municipalities, often constrained by local challenges and limited resources, might struggle to reach similar levels of adherence. It is crucial to consider these contextual differences when formulating policy interventions or capacity-building programmes. Tailored approaches that acknowledge the unique challenges municipalities face could be pivotal in enhancing their adherence to these principles. Moreover, fostering collaboration between municipalities and ministries could bridge the adherence gap, leveraging the strengths of each to achieve a more unified and effective governance framework.

6. Materials and Methods

To ensure the model's robustness, an extensive questionnaire was meticulously developed. This questionnaire encompasses five key organisational elements, assessing their current digital status. A broad range of targeted questions was included for each of these elements to enable a thorough evaluation and validation of the model. This section consists of three subsections: the first presents the study participants and procedure, the second outlines the measures, and the third discusses the statistical analysis conducted.

6.1. Study Participants and Procedure

This study targeted key decision-makers operating within two distinct levels of administrative authority, municipal (local self-government) and ministry (state government), to capture a comprehensive perspective on the digital state within public administration. The sample included 40 participants, with 30 representing municipalities and 10 drawn from ministries.

The specific functions of the respondents in this study encompassed two principal categories: leadership and technical oversight. Leadership was represented by directors of municipalities and secretary generals of ministries, highlighting the strategic decision-making tier within both local self-government and state government levels. Technical

oversight was ensured by the inclusion of heads of IT departments, a crucial component that was uniformly represented across all the participating organisations, whether municipalities or ministries. This comprehensive approach ensured that each organisation contributed insights from both perspectives, enriching the data with multifaceted views on digital transformation initiatives, which was crucial for understanding the strategic decision-making and operational challenges associated with digital efforts within Slovenian public administration.

The recruitment of participants employed a non-probabilistic convenience sampling method, leveraging established information communication systems and channels. Data collection spanned from January 2022 to April 2023, employing online personal interviews to facilitate an in-depth evaluation and a critical assessment of individual question items. The survey instrument was a comprehensive questionnaire comprising 97 closed-ended questions to ensure full coverage of the subject matter. The interview format not only ensured the 100% completion rate of the questionnaires but also provided a platform for respondents to offer additional insights beyond the structured queries. To safeguard the integrity of the responses, strict confidentiality and anonymity were assured to all participants.

6.2. Measures

The data were obtained through a comprehensive questionnaire (available in the Supplementary Materials) composed of 97 closed-ended question items, including all the supplementary questions, whereby 6 questions referred to respondents' general demographic characteristics and 91 questions referred to elements of the institution's functioning, divided into 5 thematic sections. The questionnaire's content was formulated based on a theoretical literature review by academic experts in the information technology, economic, legal, and public administration fields, which was further tested, revised and evaluated by considering practical experiences and recommendations from public managers. The demographic section covered six questions about demographic data on gender, total managerial work experience in years, total work experience in years, the field of the highest educational attainment, institution size by the number of employees, international involvement of the institution and the level of public administration. The first thematic section, technology, comprised 26 question items (52 including the supplementary questions) regarding the ICT solutions, their interoperability and integration, information security policy, open data and data analytics usage, digital channels for communication and collecting feedback, crucial internal and external barriers to digitalisation, inclusiveness and participation of users when it comes to creating new ICT solutions, etc. The second section covered processes and included 7 question items (12 including the supplementary questions) measuring the characteristics of business processes, their documentation and diagrams and having process managers appointed, etc. This was followed by a section with 7 questions on structure, addressing the digital influence on the institution's functioning, whether implementation of new ICT solutions influences the time of decision-making, changes hierarchical levels, and influences the reallocation of the tasks or authorities. The fourth section concerned organisational culture and had 10 questions on values, attitudes, and practices with regard to the digitalisation that characterises an institution. Finally, the last section included 10 questions on people, regarding the digital HRM approaches. Individual aspects of a public manager's perception of elements of the institution's functioning (i.e., agreement or frequency) were measured on a 5-point Likert scale ranging from 1 (lowest value) to 5 (highest value) (Croasmun and Ostrom 2011). Since the surveyed types of institutions varied, an extra option, "not applicable", was offered.

6.3. Statistical Analysis

The statistical analysis was performed using the IBM SPSS Statistics, the statistical data processing package Statistical Package for the Social Sciences, Version: 29.0.0.0 (241). Initial descriptive statistics were computed for each question, including the means and

standard deviations. For questions with missing data, the analysis was conducted on the remaining responses without eliminating any questions or cases. This approach ensured a more complete view of the dataset, even when some respondents did not answer specific questions.

Before conducting inferential statistical tests, assumptions were verified for the normality and homogeneity of variances. Shapiro–Wilk tests revealed that the data did not meet the normality assumption for most of the questions. Levene's test further indicated that some questions did not meet the assumption of equal variances.

In light of the data's non-normal distribution, as evidenced by the Shapiro–Wilk tests, and the presence of unequal variances for some questions, as indicated by Levene's test, we opted for the non-parametric Mann–Whitney U test for comparing the median values and mean ranks between municipalities and ministries. This choice aligned with the broader understanding of handling Likert scale data. As the interpretation of means and standard deviations for such data can be ambiguous, experts have often recommended using the median as the central measure for Likert scale data (Sullivan and Artino 2013; Jamieson 2004). The Mann–Whitney U test is particularly robust for small sample sizes and does not require the assumption of a normal distribution or equal variances between groups. The test operates by converting data into ranks and comparing the distribution of those ranks between the two independent groups. It is ideally suited for ordinal data and can detect differences in the central tendency, specifically the medians, between two independent samples. Moreover, the test also utilises the mean ranks, calculated by averaging the ranks within each group. The mean rank is a measure of the central tendency, offering insight into each group's overall tendency towards higher or lower scores on the Likert scale. A higher mean rank indicates a stronger agreement or affirmation, whereas a lower mean rank implies less agreement. By assessing the statistical significance of the differences in these mean ranks between the two groups, the Mann–Whitney U test provides a comprehensive analysis of ordinal data (Sullivan and Artino 2013; Jamieson 2004; Laerd Statistics n.d.). This dual focus on both the median and mean ranks makes the test particularly apt for datasets that do not meet the assumptions required for a parametric *t*-test.

In addition to our principal analysis, we conducted a targeted investigation into the barriers to digitalisation within Slovenian public administration. This analysis was bifurcated into two distinct categories: internal and external barriers. The data for this segment were derived from specific questionnaire items from the first thematic section, technology, that directly pertained to the challenges institutions face in the context of digitalisation. Our approach involved calculating the correlations for each barrier and segregating the data into two groups—municipalities and ministries. For internal barriers, the focus was on factors inherent to the institutions, such as the organisational structure, process and technological interoperability, employees' fear of change and weak digital skills, etc. Conversely, the external barriers encompassed challenges originating outside the institutions, like normative restrictions, lack of strategic or technical standards, weak digital skills of service users, etc. By separately analysing the correlations between organisational elements and internal and external barriers, we sought to identify and contrast the obstacles municipalities and ministries face in their digitalisation journey. This facet of our study provided a comprehensive view of each type of institution's distinct hurdles, thereby offering a more granular understanding of the digitalisation landscape within Slovenian public administration.

Lastly, to deepen our understanding of the operational and organisational differences between municipalities and ministries, we expanded our analysis to focus on the principles associated with the questionnaire items. This involved aggregating the questionnaire responses based on the principles they represent, categorised into digital principles and good governance principles. Our objective was to discern whether certain principles were more prevalent or emphasised differently in municipalities compared to ministries. Using the non-parametric Mann–Whitney U test, suitable for our data's non-normal distribution and the presence of unequal variances, we compared the median values of responses

associated with each principle between the two types of institutions. This approach allowed us to assess whether the principles were similarly or differently prioritised or manifested in the operational practices of municipalities and ministries.

7. Conclusions

This research contributes to the field of digitalisation in public administration by introducing and empirically validating a model designed for measuring the digital state in public administration, exemplified through the Slovenian public administration, juxtaposing previously held views with new empirical findings. Our analysis reveals that while Slovenia aspires to align with the European Commission's digital strategy, it faces unique challenges, particularly at the local municipal level, in achieving coherent policy implementation and developing digital competencies. In preparing the groundwork for our research, an examination of the existing digital landscape within Slovenian public administration revealed some important insights. Prior observations indicated that amidst the evolving political dynamics and stringent legalistic framework, initiatives led by the Ministry of Digital Transformation and the Ministry of Public Administration have been pivotal in striving for digital development and policy uniformity across different government levels. However, the inherent tension between Slovenia's centralised approach and the autonomy of its municipalities suggests an expected variance in digital maturity and capabilities, with ministries anticipated to demonstrate superior digital advancement owing to targeted digital skill enhancement programmes and centralised policy directives. This pre-research context set the stage for our study, prompting an expectation that ministries would outpace municipalities in digital development.

The newly developed model transcends traditional maturity models and offers a holistic framework for assessing digitalisation across organisational elements such as technology, process, structure, people, and organisational culture, and additionally through the lens of digital and good governance principles. This holistic approach allows for a nuanced understanding of the current digital state of public administration, underscoring the interplay of these elements in digital development. The study's results show that ministries in Slovenia generally possess a more advanced digital infrastructure than municipalities, particularly in various aspects of ICT development and integration. This aligns with the expectation that ministries would demonstrate higher digital maturity due to their central role and resources. However, the variability in municipalities' digital capabilities underscores a pressing need for targeted development, especially in enhancing digital infrastructure and skills. Process optimisation and digitalisation appear more consistent in ministries, reflecting their active engagement in streamlining processes. Municipalities, however, display a broader spectrum of process improvement, indicating diverse stages of digital development. In terms of organisational structure and culture, ministries exhibit a more effective and adaptable environment, whereas municipalities present varying degrees of organisational practices and cultural maturity. Both levels show potential for growth in promoting a culture of innovation, adaptability, and cross-functional collaboration. The findings highlight a gap between Slovenia's digital ambition and its on-the-ground reality, especially at the municipal level. Despite Slovenia's ranking above the EU average in digitalisation, this study reveals a slower pace of digital development and a need for systemic solutions, particularly in terms of government efficiency and digital transformation.

The comprehensive model additionally revealed significant insights into both internal and external barriers impacting digitalisation within Slovenia's public administration. Internally, municipalities face challenges, with high costs negatively affecting process optimisation and human resource management, suggesting budgetary constraints limit digital development. Process and technological interoperability issues further complicate organisational restructuring and digital adoption, underscoring the need for strategic solutions to enhance interoperability. Human factors, including resistance to change and limited digital skills, are critical barriers across both municipalities and ministries, affecting task reassignment and overall digitalisation success. Externally, the lack of digital skills

among service users, especially in rural areas, and the absence of a coherent digital strategy emerge as significant obstacles, necessitating targeted strategies for skills development and strategic planning. Our findings highlight the importance of addressing both sets of barriers to foster a beneficial environment for digital development within Slovenian public administration.

Finally, the model also allows insight into digital and good governance principles within public administration. Through a detailed analysis, we identified varying degrees of adherence to these principles between municipalities and ministries, reflecting differential capacities and strategic prioritisations. Ministries exhibited higher mean scores across most digital principles, such as "Cross-border by default" and "Openness and transparency", indicative of stronger digital infrastructures and a broader operational scope. Similarly, in good governance, principles like "Transparency" and "Rule of law" scored higher for ministries, possibly suggesting more stringent compliance at the national level. These findings highlight the need for tailored strategies to support municipalities in overcoming resource and capacity constraints to meet these digital and governance standards. Enhancing collaboration between municipalities and ministries may serve as a pivotal strategy to bridge these gaps.

The model's comprehensive nature enables a nuanced understanding of digitalisation that extends beyond technological aspects, including process optimisation, organisational structure, the people element and cultural dynamics, and offers insights into internal and external barriers and principles of good governance and digitalization. This broad perspective allows for a more informed and strategic approach to digital transformation, catering to different public entities' specific needs and contexts. The study's results highlight the critical role of measuring the digital state in public administration. By providing a clear picture of current digital capabilities and gaps, the model sets the stage for informed decision-making and strategic planning. It facilitates the identification of areas requiring attention and investment, enabling a more focused and efficient approach to digital development.

In conclusion, the development and application of this model represent a stride forward in understanding and advancing digital development in public administration. While initially validated within the Slovenian public administration, it was meticulously designed with a broader applicability in mind. The questionnaire and methodological framework were developed to be adaptable and relevant for any public organisation, regardless of the country's size or administrative structure. We aimed to create a tool that could capture the nuances of the digital state and competence in a wide range of public administration settings, from smaller countries like Slovenia to much larger ones with more extensive administrative systems. The model's emphasis on a comprehensive evaluation of digital elements underscores the necessity of a holistic approach to digitalisation, one that encompasses technological advancements, process improvements, organisational restructuring, and cultural evolution for sustainable and impactful digital progress.

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