THE IMPACT OF DIGITAL TRANSFORMATION ON THE QUALITY OF PROVINCIAL PUBLIC IN VIETNAM

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Abstract: This article examines the impact of digital transformation on public service quality across Vietnamese provinces using panel data from 63 provinces over the period 2012-2022. Digital transformation is measured by three components of the Vietnam ICT Index - technical infrastructure, human resource readiness, and information technology application - while public service quality is captured through administrative procedures and public service delivery indicators from the PAPI index. Employing a dynamic panel dataset and estimating by the Generalized Method of Moments (GMM), the results indicate that all three digital transformation components have a positive and statistically significant effect on provincial public service quality. In addition, GDP per capita, human capital, urbanization, and population density also play important roles. The findings provide empirical evidence to support policies aimed at strengthening digital infrastructure and improving digital governance to enhance public service quality in Vietnam.

Keywords: *digital transformation, public service quality, provincial - level, Vietnam*

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1. Introduction

In the context of globalization and increasingly deep economic integration, competitiveness has become one of the key factors determining the position of nations in the international arena. In Vietnam, policies on consolidation and reorganization of development spaces are fostering the emergence of economic subregions and megacities with greater scale and efficiency. For this process to achieve the desired outcomes, alongside counteracting hostile and disruptive narratives, strengthening public governance and the administration of the new institutional apparatus - toward a public service system that is inclusive both in breadth and depth - has been identified as one of the most urgent priorities. Within this context, examining the quality of public services across 63 provinces and cities is not only an essential requirement but also plays a crucial role in informing development policies tailored to the intrinsic characteristics of each locality, thereby building a foundation for effective and sustainable regional development.

Vasavakul et al. (2009) argued that effective policies - reflected through a public service mechanism designed to serve diverse societal groups - constitute the Government's approach to addressing the economic, social, political, and environmental challenges currently confronting Vietnam. The quality of public services significantly influences human capital, which is an endogenous driver of economic growth. Based on the Push - Pull Theory, human capital tends to concentrate in areas with a high-quality public service system, while less developed areas often struggle to attract skilled labor. Moreover, regional infrastructure and public services - including healthcare, education, and transportation - are powerful determinants of migration decisions and long-term settlement patterns (Hu et al., 2020).

Among the factors influencing the quality of public services today, digital transformation is viewed not merely as a supporting tool but as a dynamic capability that enables flexible adaptation and development in rapidly changing environments (Bui, 2024). According to Sarker et al. (2018), digital transformation can enhance the quality of public services by improving accessibility for citizens while simultaneously reducing costs and processing time. Through the adoption of blockchain, artificial intelligence, big data analytics, cloud computing, and other advanced technologies, digital transformation contributes to restructuring social protection systems and continuously improving service delivery efficiency and quality (Li, 2023). Today, big data is reshaping how governments manage welfare and poverty reduction by improving beneficiary identification, program coordination, and social support provision (Aiken et al., 2023). Notably, digital transformation also enables more accurate identification of individuals in need and more equitable allocation of welfare programs, as illustrated by risk assessment systems used to enhance the efficiency of child protection services in the United States (Eubanks, 2018).

From a broader macro perspective, digital transformation further contributes to reshaping governance models, development paradigms, and the quality of public services. This transformative capacity stems from the exceptional ability of digital technologies to store, access, and share knowledge rapidly and efficiently. According to the UNCTAD Digital Economy Report (2019), humanity can accumulate more knowledge every 2.5 to 3 years than the entirety of human history prior, thanks to highly efficient digital storage, retrieval, and information-sharing systems. The growth of accumulated knowledge expands opportunities for information access and technical cooperation, thereby generating new employment opportunities, facilitating skill transfer, enhancing productivity, and strengthening accountability in both the public and private sectors (Finger, 2007). It is evident that digital transformation is not merely a technological driver but also a strategic foundation for advancing the quality of public services in the digital era.

As Vietnam actively implements the "National Strategy on the Fourth Industrial Revolution to 2030," the profound and far-reaching impact of digital transformation has increasingly drawn attention to its role in improving the quality of public services at the local level. However, most existing studies on competitiveness in general and public services in particular tend to focus on analyzing individual provinces (Bui, 2024), resulting in a lack of in-depth, comparative studies on provincial competitiveness across economic regions and inter-provincial clusters. Furthermore, although digital transformation has become a topic of growing scholarly interest, empirical research in Vietnam remains concentrated primarily at the national, sectoral, or enterprise level, while the effects of digital transformation on the quality of public services have yet to be adequately examined. To address part of this gap, this study investigates the impact of digital transformation on the quality of public services across 63 provinces and cities in Vietnam during the period 2012-2022, using data compiled from the Vietnam ICT Index (issued by the Ministry of Information and Communications) and the Provincial Governance and Public Administration Performance Index (PAPI), published by the Centre for Community Support and Development Studies (CECODES).

The article consists of five sections: Section 1 presents the Introduction; Section 2 outlines the Literature Review; Section 3 describes the Research Method; Section 4 presents the Study Results; and Section 5 provides Conclusions.

2. Literature review

According to Kadyrova (2021), the quality of public services is understood as a set of attributes associated with

both the process and outcomes of service delivery aimed at meeting the needs of service recipients. In this regard, citizen satisfaction is a widely used indicator reflecting the extent to which public expectations are fulfilled after their actual interactions with government agencies. The study indicates that the quality of public services is closely linked to procedural factors (transparency, clarity, convenience, and processing time) and service delivery conditions (staff competence, technical infrastructure, and responsiveness) - all of which directly influence citizens' perceptions. This approach is particularly relevant to the Vietnamese context, where the quality of public services depends substantially on the performance of the administrative apparatus and its capacity to provide essential services to the population. Numerous studies have shown that poor-quality public services, complex procedures, or a lack of transparency can impede citizens' access and create inequalities in service benefits (Seery, 2014; Moynihan et al., 2016). Therefore, improving the quality of public services is considered a critical condition for promoting sustainable and inclusive development in Vietnam.

Meanwhile, digital transformation is defined as the processes and strategic applications of digital technologies that bring about significant changes in how organizations operate and deliver services (Suedi & Zulfikar, 2023). In other words, digital transformation goes beyond the adoption of new technologies; it entails a comprehensive restructuring of service-providing institutions to enhance efficiency, transparency, and public value. This is not merely a trend but an essential requirement of modern administrative reform. According to Sarker et al. (2018), the core objective of digital transformation in public services is to improve accessibility, reduce costs, and shorten administrative processing time. Hence, digital transformation is recognized as a key factor in modernizing governance and enhancing the quality of public services; however, it also faces challenges such as limited ICT infrastructure, cybersecurity risks, and digital divides between regions and demographic groups (Ragnedda et al., 2022).

In Vietnam, the effectiveness of digital transformation in general and information technology in particular is reflected through three dimensions: technical infrastructure, human infrastructure, and the level of practical IT application. Accordingly, the impact of digital transformation on the quality of public services is typically transmitted through these dimensions (Hoang & Le, 2024).

Regarding technical infrastructure, it is regarded as the material foundation for digitalization and the provision of online public services. Components such as network systems, databases, and digital platforms enable local governments to deliver public services with broader coverage and higher operational efficiency. Singh et al. (2014) show that the adoption of data platforms and digital technologies can improve service quality in essential public sectors by enhancing information-processing capacity and resource allocation. In the Vietnamese context, disparities in the level of technical infrastructure development across localities-particularly between urban and rural areas-may constrain accessibility and service stability (Hoang & Le, 2024), thereby negatively affecting public service quality.

Second, human infrastructure reflects the capacity of civil servants and public officials to utilize and operate information technology systems. From the Digital Era Governance (DEG) perspective, digital transformation is not merely a technological issue but also requires changes in capabilities and working practices within the public administration (Margetts & Dunleavy, 2013). When officials possess appropriate digital skills, new systems can be effectively integrated into administrative processes, contributing to greater accuracy, transparency, and responsiveness of public services. Conversely, according to the World Bank (2016), limitations in digital human capital in developing countries may undermine the effectiveness of public service digitalization efforts.

Third, the level of practical IT application serves as an indicator of how technical and human infrastructure potentials are realized. The implementation of online public services and the integration of administrative processes on digital platforms help reduce transaction costs, shorten processing time, and enhance inter-agency coordination. Margetts and Dunleavy's (2013) DEG framework emphasizes the role of service reintegration and digital innovation in improving public sector performance. However, increasing levels of IT application also heighten dependence on digital systems, introducing risks related to cybersecurity and service disruption, such as ransomware attacks analyzed by Gawazah et al. (2024). If not effectively governed, these risks may undermine public service quality, particularly for essential services.

Overall, digital transformation is a crucial driver contributing to the enhancement of public service quality in many countries, including Vietnam, by increasing transparency, reducing transaction costs, and improving the operational efficiency of the administrative apparatus. However, its impacts depend largely on local readiness, citizens' access to digital technologies, and the extent to which digital infrastructure is secure and coherent. In the context of Vietnam, examining the influence of digital transformation on the quality of public services is necessary to better understand the mechanisms of impact and the conditions required to maximize the benefits of digitalization at the provincial level.

In summary, most previous studies have indicated a positive correlation between digital transformation and the quality of public services. Therefore, the authors propose the following hypothesis:

(H): Digital transformation has a positive impact on the quality of public services in Vietnam.

3. Research method

3.1. Variables in the model

Public service quality

This study employs the Provincial Governance and Public Administration Performance Index (PAPI) in Viet Nam, jointly implemented by the United Nations Development Programme (UNDP) and the Centre for Community Support Development Studies (CECODES), following the approach proposed by Giang et al. (2020). The PAPI index is currently applied to all 63 provinces nationwide and consists of eight dimensions: Participation at the local level; Transparency; Vertical accountability toward citizens; Control of corruption in the public sector; Public administrative procedures; Public service delivery; Environmental governance; E-governance. These dimensions are standardized on a scale from 1 (indicating the poorest governance performance) to 10 (indicating the best governance performance) to assess provincial-level governance effectiveness.

Following Giang et al. (2020), the authors use two dimensions - Public Administrative Procedures and Public Service Delivery - to measure provincial-level public service quality. These two dimensions are normalized on a scale from 1 to 10, under the assumption that they carry equal weights.

Digital transformation

The study measures digital transformation using the ICT Readiness Index for Development and Application in Viet Nam, developed under the leadership of the Authority of Information Technology Industry (AITI), Ministry of Information and Communications, in collaboration with the Vietnam Informatics Association. This index provides a standardized framework for data collection, assessment, and evaluation of ICT development across ministries, sectors, and localities.

According to Hoang & Le (2024), this index provides information on the current status of ICT development and application in Vietnam, while also offering assessments and rankings based on the level of readiness for ICT development. The ICT Index ranges from 0 to 1, with values closer to 1 indicating a higher level of technological advancement. The index consists of three main components: technical infrastructure, human resources, and information technology application. This structure is consistent with the United Nations' EGDI framework, in which digital transformation is determined by connectivity infrastructure, human capital, and the level of digital service provision and application. According to Le et al. (2025), the use of the three indicators: technical infrastructure, human infrastructure, and IT application as independent variables has a clear theoretical foundation, as they represent the core pillars reflecting digital readiness, absorptive capacity, and the degree of digital technology realization of an organization or locality.

Control variables

Control variables are constructed using data published in the Statistical Yearbooks of Vietnam by the General Statistics Office (GSO) at the provincial level. These variables include: GDP per capita; human capital (measured by the proportion of trained workers aged 15 and above); urbanization (measured by the proportion of the permanent urban population); and population density.

After compiling data from the above sources, the study conducts descriptive statistics and index calculations using Stata 14, employing a panel data structure. The dataset covers 63 provinces and cities in Vietnam over six survey years (2012, 2014, 2016, 2018, 2020, and 2022), resulting in a total of 311 observations.

3.2. Methodology

The impact of digital transformation on public service quality is assessed using the following regression equation:

$$PublicService_{jt} = \beta_0 + \beta_1 * TI_{jt} + \beta_2 * HR_{jt} + \beta_3 * ITA_{jt} + \beta_4 X_{jt} + u_{jt} \quad (1)$$

Trong đó:

$PublicService_{jt}$ denotes the public service quality index of province j in year t;

TI_j represents the technical infrastructure index;

HR_{jt} denotes the human resource infrastructure index;

ITA_{jt} refers to the information technology application index;

X_{jt} is a vector of control variables, including GDP per capita, human capital, urbanization, population density, and economic regions;

u_{jt} captures unobserved factors in the model.

The study employs panel data combining cross-sectional data from 63 provinces and a time series covering the period 2012–2022, yielding 378 observations. To estimate the model, the GMM approach is adopted because Pooled OLS, FEM, and REM cannot simultaneously address endogeneity, heteroskedasticity, and autocorrelation. The IV-2SLS method is not suitable due to the difficulty in identifying valid external instrumental variables, while ARDL requires a longer time dimension than that available in the dataset. Therefore, GMM is employed as it effectively mitigates endogeneity and autocorrelation through lagged variables and eliminates unobserved fixed effects. System GMM improves estimation efficiency by combining equations in first differences and levels, allowing the use of additional internal instruments. This method effectively addresses endogeneity, unobserved fixed effects, and autocorrelation, especially in dynamic panel models with small T and large N.

First, the Durbin-Wu-Hausman test is conducted to assess the appropriateness of the GMM approach. As reported in Table 1, all models yield p-values below 0.05, indicating the presence of endogeneity. Endogeneity leads to biased and inconsistent estimates under conventional estimation methods; therefore, the use of GMM helps mitigate this problem.

The study incorporates the lagged dependent variable in the GMM framework to address endogeneity, model dynamic relationships, and provide valid instrumental variables, thereby improving the accuracy and validity of the estimated coefficients. Accordingly, Equation (1) is reformulated into the following dynamic specification:

$$PublicService_{jt} = \beta_0 + \beta_1 * PublicService_{jt} + \beta_2 * TI_{jt} + \beta_3 * HR_{jt} + \beta_4 * IPA_{jt} + \beta_5 X_{jt} + u_{jt} \quad (2)$$

In addition, the study employs the Hansen (or Sargan) test to examine the validity of the instrumental variables, and the Arellano-Bond (AR) test to assess serial correlation in the differenced error terms, particularly second-order autocorrelation (AR(2)). As shown in Table 1, the Hansen test yields p-values greater than 0.10, indicating that the instruments used are valid. The Arellano-Bond test produces p-values above 0.05, suggesting the absence of second-order autocorrelation in the residuals of the estimated model.

4. Study results

4.1. The state of digital transformation and public services quality in Vietnam

Digital transformation

Figure 1 illustrates considerable fluctuations in Viet Nam's digital transformation during the period 2012-2022. Specifically, the Technical Infrastructure Index exhibits noticeable volatility; however, its overall score increased by 0.16 points over the entire study period, with a particularly strong rise of 0.22 points during 2018-2022, equivalent to an increase of 68.75%.

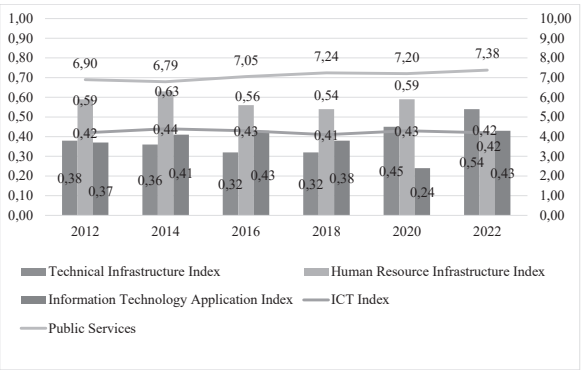
In contrast, the Human Resource Infrastructure Index experienced a pronounced and persistent decline. Initially the highest-performing sub-index in the early years (peaking at 0.63 in 2014), it continuously decreased and reached a low of 0.42 in 2022, falling below both technical infrastructure and ICT application indices.

The Information and Communication Technology (ICT) Application Index demonstrates irregular fluctuations, recording a sharp decline to a historic low of 0.24 in 2020, followed by a remarkable recovery to 0.43 in 2022, approaching the highest level observed in the preceding period.

Overall, the composite ICT index remained relatively stable in the early years, fluctuating slightly around 0.42-0.44 from 2012 to 2016, and showed signs of stagnation in 2018, when it declined to 0.41. Nevertheless, the period 2020-2022 witnessed a clear breakthrough, with the index reaching a peak of 0.46 in 2022. This trend suggests that recent digital transformation efforts have begun to yield positive quantitative outcomes.

The simultaneous growth of the composite ICT index and the Technical Infrastructure Index in the later period (2020-2022) reflects the strong impact of the National Digital Transformation Program as well as the digitalization pressure induced by the COVID-19 pandemic, which stimulated substantial public investment in hardware and network infrastructure. However, the decline in the Human Resource Infrastructure Index indicates that the pace of training and digital capacity building among civil servants has not kept up with equipment investment, creating a "time lag" and structural imbalance in ICT development.

Figure 1. Average scores of the digital transformation index and public service quality across 63 provinces and cities in Vietnam, 2012-2022



Source: Authors' calculations

Public service quality

Figure 1 also depicts an upward trend in the quality of public service delivery over the period 2012-2022, with an overall increase of 0.48 points. Although the index experienced a slight decline during 2012-2014 (a decrease of 0.11 points), it subsequently recovered and maintained steady growth, reaching its highest level of 7.38 in 2022.

The public service quality curve consistently remains at a relatively high level (above the upper-middle range of the 10-point scale) and exhibits a steadily increasing slope, indicating gradual improvements in citizen satisfaction and public governance effectiveness over time.

Improvements in the Public Service Quality Index can be attributed to decisive public administrative reform (PAR) policies and the implementation of the "one-stop shop" and "interconnected one-stop shop" mechanisms. In particular, during the 2020-2022 period, the synergy created by the enhancement of technical infrastructure (as discussed in the ICT analysis) provided a solid foundation for the deployment of online public services at Levels 3 and 4, thereby increasing transparency and convenience for citizens and ultimately improving evaluation scores.

4.2. The impact of digital transformation on provincial-level public service quality in Vietnam

Table 1. Estimation results of the impact of digital transformation on public service quality across 63 provinces and cities in Vietnam, 2012-2022

Independent variable		**Regression coefficient**	**Standard deviation**
		Public Services	
Lagged Public Services		0.2553***	0.0299
Technical Infrastructure Index		0.1349**	0.0806
Human Resource Infrastructure Index		0.3328***	0.0493
Information Technology Application Index		0.1003**	0.0390
Control variables			
GDP per capita		0.0017**	0.0007
Human capital		0.0150***	0.0038
Urbanization		-0.0020***	0.0002
Population density		-0.00004**	0.00002
Economic region *(Reference category: Northern Midlands and Mountainous Areas)*	Red River Delta	0.0221**	0.0911
	North Central and Central Coastal Region	0.1591***	0.0747
	Central Highlands	-0.0036*	0.1095
	Southeast	-0.0409**	0.1087
	Mekong River Delta	0.1384**	0.0899
Constant		5.1153***	0.2206
Wald chi2 (13)		16132.78	
Prob>chi2		0.000	
Wu-Hausman F		0.0001	
AR(2) (P-value)		0.073	
Hansen J. (P-value)		0.115	
Number of observations		311	
Number of instrumental variables		60	
Statistical significance levels: * p<0.1; ** p<0.05; ***p<0.01			

Source: Compiled by the authors

Table 1 reports the effects of digital transformation on provincial-level public service quality across 63 provinces and cities in Vietnam during the period 2012-2022. Overall, all three components of digital transformation exert positive and statistically significant effects on public service quality.

Regarding technical infrastructure, at the 5% significance level, a 0.1-point increase in the Technical Infrastructure Index is associated with an increase of 0.1349 points in the Public Service Quality score. This finding is consistent with prior domestic and international studies, including West (2004), Osborne et al. (2022), Chien and Thanh (2022), and Pham et al. (2023). The underlying explanation is that technical infrastructure, such as internet connectivity and subscriber density, constitutes a fundamental prerequisite for system quality, enabling public services to operate in a stable, rapid, and convenient manner, thereby directly enhancing user experience. Extensive connectivity networks facilitate citizens' access to information and strengthen their ability to monitor government performance. Moreover, advanced digital infrastructure enables two-way interaction channels (e.g., digital citizen applications), allowing governments to receive and respond to public feedback in a timely manner, which in turn reinforces trust and increases overall citizen satisfaction.

With respect to human resource infrastructure, at the 1% significance level, a 0.1-point increase in the Human Resource Infrastructure Index leads to an increase of 0.3328 points in public service quality, representing the largest marginal effect among the digital transformation components. This result can be explained by the critical role of high educational attainment and professional competence among public officials (government human resource infrastructure) in ensuring accurate, lawful decision-making and reducing administrative processing time (Korbaffo and Efu, 2025). At the same time, a higher level of social human capital enhances citizens' capacity to access and effectively use public services, thereby reducing technical barriers and frustration stemming from procedural misunderstandings. The compatibility between strong service provision capacity on the government side and high absorptive capacity on the citizen side generates a superior service experience, which substantially increases satisfaction with provincial public service quality (Tuan et al., 2023).

Similar to technical infrastructure, information technology application also exhibits a positive effect: public service quality increases by 0.1003 points when the IT Application Index rises by 0.1 points. According to West (2004) and GC et al. (2024), the extensive application of information technology in internal administrative processes helps standardize and automate procedures, eliminate redundant manual tasks, and significantly shorten processing time for service delivery. Online public service systems and electronic document management enhance procedural transparency, allowing citizens to track processing progress and reducing the risks of rent-seeking behavior or informal payments. In the Vietnamese context, Nguyen et al. (2020) emphasize that system quality, information quality, reliability, and transparency are key determinants of citizen satisfaction with provincial public service quality.

In addition, Table 1 reveals the effects of demographic and socioeconomic characteristics on provincial public service quality during the study period. While GDP per capita and human capital exert positive effects, urbanization and population density display negative associations with public service quality. Specifically, a one-unit increase in GDP per capita and human capital raises public service quality by 0.0017 and 0.0150 points, respectively. Conversely, a 1 percentage point increase in the urbanization rate and an increase of one person in population density reduce public service quality by 0.0020 and 0.00004 points, respectively. Furthermore, public service quality varies across economic regions in Vietnam, with scores tending to increase in the Red River Delta, North Central and Central Coastal Region, and Mekong River Delta, while declining in the remaining regions.

5. Conclusion

Building upon the findings presented in Chapter 4, the authors propose several recommendations for the Government and local authorities in designing programs and policies aimed at enhancing the quality of public services amid the ongoing process of digital transformation.

The empirical results indicate that indicators of digital transformation are positively associated with the quality of public services in Vietnam.

First, the institutional reform agenda should focus on improving the legal framework and governance mechanisms in line with the requirements of digital transformation in the public sector. The State should continue to review, revise, and harmonize regulations related to public service delivery toward simplifying administrative procedures, enhancing transparency, and adopting a citizen-centric approach. The expansion of fully online public services should be implemented within a unified institutional framework that ensures interoperability and data sharing among ministries, sectors, and local governments. At the same time, the digital institutionalization of mandatory disclosure regarding processing progress, time limits, responsible authorities, and outcomes of administrative procedures is necessary to strengthen administrative accountability and enhance public trust in government. In addition, developing a comprehensive set of public service quality indicators - capturing transparency, procedural simplicity, and the actual effectiveness of essential public services - should be regarded as a key instrument for policy adjustment and resource allocation.

Second, human resource development plays a pivotal role in realizing digital transformation goals and improving public service quality. The research findings indicate that digital transformation yields positive effects only when operated by civil servants with adequate professional competence, digital skills, and a strong service orientation. Accordingly, public agencies should implement regular and systematic training programs on digital skills, citizen-service skills, and sector-specific knowledge tailored to public service domains such as healthcare, education, land administration, and business registration. Training modalities should be innovated toward blended learning to enhance flexibility and practical applicability. In parallel, performance evaluation mechanisms for civil servants should be outcome-based, with citizen and business satisfaction identified as a core criterion. Public disclosure of periodic evaluation results would further strengthen accountability while motivating civil servants to proactively innovate and improve service quality.

Third, solutions related to infrastructure and public service delivery models should aim to ensure coherence, inclusiveness, and adaptability to rapidly changing socio-economic conditions. The State should continue investing in digital infrastructure, ensuring information security and personal data protection, while enhancing interoperability among national and local databases. Public service delivery models should be developed in a multi-channel manner, harmoniously combining digital platforms with traditional methods to meet the needs of diverse population groups, particularly the elderly, residents in remote or disadvantaged areas, and groups with limited digital skills. Moreover, expanding public-private partnership models in public service provision can help mobilize social resources, improve service quality, and alleviate fiscal pressure. Notably, the application of big data and artificial intelligence in demand forecasting, performance monitoring, and anomaly detection would enable policy design and implementation to become more proactive, flexible, and better aligned with the national digital transformation process.

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