AN EMPIRICAL INVESTIGATION OF DIGITAL TRANSFORMATION AND E-GOVERNANCE EFFECTIVENESS IN THE MALAYSIAN PUBLIC SECTOR

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ABSTRACT

This study investigates the relationship between digital transformation and e-governance effectiveness in Malaysia's public sector, employing an integrated model based on the Technology–Organization–Environment (TOE) framework and the Unified Theory of Acceptance and Use of Technology (UTAUT). Despite Malaysia's progressive digital initiatives under the MyDIGITAL Blueprint and the Public Sector Digitalisation Strategic Plan (2021–2025), variations persist in the implementation and utilization of e-government systems across ministries and agencies. Using a quantitative research design, data were collected from 354 civil servants across federal and state institutions in Putrajaya, Kuala Lumpur, and Selangor. Partial Least Squares Structural Equation Modeling (PLS-SEM) was applied to examine the effects of technological readiness, organizational capability, environmental policy support, performance expectancy, and facilitating conditions on e-governance effectiveness. The results reveal that all five constructs significantly influence e-governance effectiveness, explaining 68.1% of its variance. Among these, organizational capability emerged as the strongest predictor, followed by environmental policy support and facilitating conditions. The findings highlight that the success of digital transformation in Malaysia's public sector depends not only on technological infrastructure but also on institutional readiness, supportive policy environments, and user acceptance. The study contributes theoretically by empirically validating an integrated TOE–UTAUT model in a developing-country public sector context

and offers practical insights for strengthening interoperability, capacity building, and citizen-centric digital service delivery.

Abstrak
Penelitian ini mengkaji hubungan antara transformasi digital dan efektivitas e-governance di sektor publik Malaysia dengan menggunakan model terintegrasi yang berbasis pada kerangka Technology–Organization–Environment (TOE) dan Unified Theory of Acceptance and Use of Technology (UTAUT). Meskipun Malaysia telah meluncurkan berbagai inisiatif digital strategis melalui MyDIGITAL Blueprint dan Public Sector Digitalisation Strategic Plan (2021–2025), masih terdapat perbedaan dalam tingkat implementasi dan pemanfaatan sistem e-government di antara kementerian dan lembaga pemerintah. Penelitian ini menggunakan desain kuantitatif dengan pengumpulan data dari 354 pegawai negeri sipil di lembaga pemerintah federal dan negara bagian yang berlokasi di Putrajaya, Kuala Lumpur, dan Selangor. Analisis data dilakukan menggunakan Partial Least Squares Structural Equation Modeling (PLS-SEM) untuk menguji pengaruh kesiapan teknologi, kapabilitas organisasi, dukungan kebijakan lingkungan, ekspektasi kinerja, dan kondisi fasilitasi terhadap efektivitas e-governance. Hasil penelitian menunjukkan bahwa kelima konstruk tersebut berpengaruh signifikan terhadap efektivitas e-governance, dengan kemampuan penjelasan model sebesar 68,1 persen. Di antara faktor-faktor tersebut, kapabilitas organisasi merupakan prediktor paling dominan, diikuti oleh dukungan kebijakan lingkungan dan kondisi fasilitasi. Temuan ini menegaskan bahwa keberhasilan transformasi digital di sektor publik Malaysia tidak hanya bergantung pada infrastruktur teknologi, tetapi juga pada kesiapan institusional, lingkungan kebijakan yang mendukung, serta penerimaan pengguna. Secara teoretis, penelitian ini memvalidasi secara empiris model terintegrasi TOE–UTAUT dalam konteks sektor publik negara berkembang, dan secara praktis memberikan implikasi kebijakan untuk memperkuat interoperabilitas, pengembangan kapasitas, serta penyediaan layanan digital publik yang berorientasi pada warga negara.

INTRODUCTION

In the 21st century, digital transformation has become a central driver of governance effectiveness, public service efficiency, and citizen engagement. Governments increasingly deploy information and communication technologies (ICT), data analytics, and integrated digital platforms to enhance transparency, accountability, and administrative coordination (Pandey, 2023; Sharmin & Chowdhury, 2025). While advanced digital governments such as Singapore, South Korea, and Estonia demonstrate the transformative potential of e-governance, evidence from developing and middle-income countries indicates that digital transformation outcomes remain highly uneven and strongly shaped by institutional and contextual conditions (Bouteraa, 2024).

Within Southeast Asia, Malaysia is widely regarded as a leading digital economy due to its sustained policy commitment to public-sector digitalisation. National initiatives such as the MyDIGITAL Blueprint (2021–2030) and the Public Sector Digitalisation Strategic Plan (PSDSP)

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2021–2025 articulate an ambitious vision of end-to-end digital public services, data-driven governance, and integrated government systems. Under these frameworks, federal and state agencies located in Putrajaya, Kuala Lumpur, and Selangor are designated as national administrative and innovation centres expected to spearhead public-sector digital transformation (MAMPU, 2024). Despite these policy advances, however, the effectiveness of e-governance implementation in Malaysia remains uneven across ministries, agencies, and levels of government.

Empirical evidence suggests that Malaysia's e-governance outcomes are characterised by institutional fragmentation, uneven digital maturity, and inconsistent implementation capacity, even among agencies operating under the same national digitalisation agenda (Mustafazade, 2024). While some public institutions have achieved high levels of digital integration and service automation, others continue to experience siloed systems, limited interoperability, and low utilisation of e-government platforms. These disparities indicate that technological investment and policy commitment alone are insufficient to guarantee effective digital governance outcomes.

From a technological perspective, Malaysia has made substantial progress in ICT infrastructure development, with broadband penetration exceeding 97 percent in urban administrative centres (MCMC, 2025). Nevertheless, persistent challenges related to system interoperability, cybersecurity resilience, and the integration of legacy platforms continue to constrain effective data sharing and coordinated service delivery across government agencies (Abdullah & Haron, 2024). Organisationally, variations in digital skills, innovation culture, and change readiness among public servants further affect the consistent adoption and utilisation of e-governance systems (Yusof et al., 2023). Environmentally, although Malaysia benefits from relatively strong regulatory and policy frameworks, gaps in implementation coordination, standardisation, and procurement flexibility undermine the full realisation of digital governance objectives (Rahman et al., 2024).

Despite the growing scholarly interest in e-governance in Malaysia, much of the existing literature remains either conceptual or single-dimensional, focusing narrowly on ICT readiness, policy frameworks, or citizen adoption in isolation. Few empirical studies have examined how technological readiness, organisational capability, environmental policy support, and user-level acceptance factors jointly influence e-governance effectiveness, particularly within agencies operating under the same national digitalisation framework (Rahman & Yusof, 2023; Taufiqurokhman et al., 2025). This limitation constrains both theoretical development and evidence-based policy evaluation, as it remains unclear which factors most strongly explain variations in governance effectiveness across public institutions.

This gap is particularly critical given that PSDSP-designated administrative and innovation hubs such as Putrajaya, Kuala Lumpur, and Selangor are expected to function as benchmarks for digital government performance. The absence of a multi-dimensional, empirically validated framework hampers policymakers' ability to assess whether digital transformation initiatives have translated into tangible improvements in efficiency, transparency, and service quality. Without such evidence, there is a risk that public-sector digitalisation efforts may continue to prioritise technological deployment at the expense of organisational readiness and sustained system utilisation.

In response to these challenges, this study adopts an integrated analytical approach by combining the Technology–Organization–Environment (TOE) framework with the Unified Theory of Acceptance and Use of Technology (UTAUT). The TOE framework provides an institutional perspective by capturing technological readiness, organisational capability, and environmental policy support, while UTAUT explains user-level acceptance through performance expectancy and facilitating conditions (Bouteraa, 2024; Hržica et al., 2025). By empirically testing this integrated model using data collected from public officers in federal and state agencies located in Putrajaya,

Kuala Lumpur, and Selangor, this study offers a contextualised assessment of digital transformation and e-governance effectiveness within Malaysia's core public-sector digitalisation ecosystem.

Accordingly, this study seeks to examine how technological, organisational, environmental, and user-level factors jointly influence e-governance effectiveness in Malaysia's public sector. Specifically, it investigates the effects of technological readiness, organisational capability, environmental policy support, performance expectancy, and facilitating conditions on e-governance effectiveness. From these objectives, the following hypotheses are proposed:

H₁ technological readiness positively influences e-governance effectiveness

H₂ organisational capability positively influences e-governance effectiveness

H₃ environmental policy support positively influences e-governance effectiveness

H₄ performance expectancy positively influences e-governance effectiveness and

H₅ facilitating conditions positively influence e-governance effectiveness.

Through empirical testing using Partial Least Squares Structural Equation Modeling (PLS-SEM), this study contributes both theoretically and practically by validating an integrated TOE–UTAUT framework and providing evidence-based insights for strengthening institutional readiness, inter-agency coordination, and user support mechanisms to enhance the effectiveness, inclusiveness, and sustainability of e-governance implementation in Malaysia.

METHOD

This study employs a quantitative, explanatory research design aimed at empirically examining the relationship between digital transformation and e-governance effectiveness in Malaysia's public sector. The approach allows for testing theoretical relationships and provides measurable evidence to validate the integrated model based on the Technology–Organization–Environment (TOE) and Unified Theory of Acceptance and Use of Technology (UTAUT) frameworks (Bouteraa, 2024). The research focuses on how technological readiness, organizational capability, and environmental policy support, together with user-level factors such as performance expectancy and facilitating conditions influence the effectiveness of e-governance implementation in Malaysia (Hržica et al., 2025). Data were collected from federal and state government agencies located in Putrajaya, Kuala Lumpur, and Selangor, representing the nation's administrative and innovation hubs under the Public Sector Digitalisation Strategic Plan (PSDSP) 2021–2025.

The study population consisted of approximately 4,200 civil servants and ICT officers directly involved in planning, managing, or utilizing digital platforms. A proportionate stratified random sampling technique was employed to ensure representation across functional divisions, and a sample size of 354 respondents was determined using Taro Yamane's (1973) formula at a 95% confidence level. Primary data were obtained through a structured questionnaire with items adapted from prior TOE and UTAUT studies. The instrument used a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"), measuring technological readiness, organizational capability, environmental policy support, performance expectancy, and facilitating conditions, while e-governance effectiveness was assessed through indicators of service efficiency, transparency, and citizen satisfaction (MAMPU, 2024). A pilot test with 35 respondents from the Ministry of Digital

and the Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) yielded Cronbach's alpha values between 0.78 and 0.89, confirming reliability.

Data analysis involved descriptive statistics using SPSS Version 27 and inferential analysis using SmartPLS 4.0. The measurement model was assessed for reliability and validity through Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE), while discriminant validity was verified using the Fornell–Larcker criterion and HTMT ratio. Structural relationships were tested using Partial Least Squares Structural Equation Modeling (PLS-SEM), examining path coefficients (β), t-values, p-values, and R^2 values through a bootstrapping process with 5,000 resamples. Model fit was evaluated using the Standardized Root Mean Square Residual (SRMR) and Predictive Relevance (Q^2) indices. Ethical approval was granted by the Universiti Utara Malaysia Human Research Ethics Committee (UUM-HREC), and all participants were assured of confidentiality, anonymity, and voluntary participation.

RESULT AND DISCUSSION

Measurement Model Evaluation

The measurement model was assessed to ensure the reliability and validity of the constructs before testing the structural relationships. Table 1 presents the results of internal consistency reliability and convergent validity based on Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). All indicators met the threshold values ($\alpha > 0.70$, CR > 0.70, AVE > 0.50), indicating satisfactory reliability and convergent validity.

Table 1.
Reliability and Convergent Validity of Constructs

Construct	Cronbach's α	CR	AVE	Decision
Technological Readiness	0.873	0.905	0.659	Accepted
Organizational Capability	0.891	0.920	0.682	Accepted
Environmental Policy Support	0.864	0.902	0.654	Accepted
Performance Expectancy	0.852	0.894	0.627	Accepted
Facilitating Conditions	0.871	0.907	0.662	Accepted
E-Governance Effectiveness	0.899	0.924	0.675	Accepted

All constructs displayed strong reliability, confirming that the items used to measure each variable were consistent. The Average Variance Extracted (AVE) values above 0.5 indicate that more than 50% of the variance in the observed variables is explained by the latent construct. Discriminant validity was established using the Fornell–Larcker criterion. Table 2 shows that the square root of each construct's AVE (bold diagonal values) exceeded its correlations with other constructs, demonstrating adequate discriminant validity.

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Table 2.

Discriminant Validity (Fornell–Larcker Criterion)

Construct	Tech Readiness	Org Capability	Env Policy	Perf Expectancy	Facil. Conditions	E-Gov Effectiveness
Technological Readiness	**0.812**	0.622	0.583	0.601	0.633	0.671
Organizational Capability	0.622	**0.826**	0.648	0.614	0.653	0.689
Environmental Policy Support	0.583	0.648	**0.809**	0.601	0.639	0.667
Performance Expectancy	0.601	0.614	0.601	**0.792**	0.645	0.671
Facilitating Conditions	0.633	0.653	0.639	0.645	**0.814**	0.694
E-Governance Effectiveness	0.671	0.689	0.667	0.671	0.694	**0.822**

These results confirm that all constructs were conceptually and empirically distinct from one another, ensuring the measurement model's adequacy for structural testing.

Structural Model Assessment

After confirming reliability and validity, the structural model was evaluated to test the hypothesized relationships among constructs. The model's predictive accuracy was assessed using the coefficient of determination (R^2) and predictive relevance (Q^2). The R^2 value for E-Governance Effectiveness was 0.681, indicating that 68.1% of its variance is explained by the five independent variables. The SRMR value of 0.056 and $Q^2 = 0.47$ further confirmed the model's good fit and predictive relevance.

Table 3.

Structural Model and Hypotheses Testing

Hypothesis	Relationship	β (Path Coefficient)	t-value	p-value	Decision
H₁	Technological Readiness → E-Governance Effectiveness	0.184	3.276	0.001	Supported
H₂	Organizational Capability → E-Governance Effectiveness	0.267	4.518	0.000	Supported
H₃	Environmental Policy Support → E-Governance Effectiveness	0.201	3.912	0.000	Supported
H₄	Performance Expectancy → E-Governance Effectiveness	0.153	2.847	0.004	Supported
H₅	Facilitating Conditions → E-Governance Effectiveness	0.198	3.565	0.000	Supported

All path coefficients were positive and statistically significant at $p < 0.05$, confirming that all five constructs significantly influence e-governance effectiveness in Malaysia. Among them, organizational capability (β = 0.267) emerged as the strongest predictor, followed by environmental policy support (β = 0.201) and facilitating conditions (β = 0.198).

Discussion of Findings

The findings of this study provide robust empirical evidence that digital transformation significantly enhances e-governance effectiveness in Malaysia's public sector, supporting and

extending prior research in digital governance and public administration. The high explanatory power of the model ($R^2 = 0.681$) indicates that technological, organisational, environmental, and user-level factors jointly shape governance outcomes, consistent with earlier studies that emphasise the multi-dimensional nature of e-governance effectiveness (OECD, 2023; UNDESA, 2023).

The result that organisational capability is the strongest predictor of e-governance effectiveness aligns closely with prior empirical studies in both developed and developing country contexts. Aziz and Zakuan (2025) found that organisational readiness, managerial commitment, and internal coordination significantly influence the success of digital initiatives in Malaysia's public administration. Similarly, Rahman and Yusof (2023) reported that differences in organisational culture and staff competence explain variations in the utilisation of e-government platforms across Malaysian agencies. This study extends these findings by demonstrating that organisational capability remains dominant even within PSDSP-designated administrative and innovation hubs, suggesting that proximity to policy centres does not automatically translate into effective digital governance. From a theoretical perspective, this supports TOE-based arguments that organisational conditions play a decisive mediating role between technological investment and performance outcomes, particularly in hierarchical public-sector systems.

The significant influence of environmental policy support corroborates earlier research highlighting the importance of regulatory frameworks and national coordination in shaping e-governance outcomes. Studies by Abdullah et al. (2024) and Taufiqurokhman et al. (2025) show that strong policy mandates and central oversight mechanisms can accelerate digital adoption across public institutions. In the Malaysian context, the findings reinforce Mustafazade's (2024) argument that national digital strategies such as MyDIGITAL and the Public Sector Digitalisation Strategic Plan (PSDSP) exert substantial institutional pressure on agencies to align with digital standards. However, this study goes further by empirically demonstrating that policy support not only encourages adoption but also directly contributes to governance effectiveness when accompanied by organisational capability and user support. This refines the TOE framework by positioning the environmental dimension as both a coercive and enabling institutional force in policy-driven digital states.

With respect to technological readiness, the positive and significant relationship with e-governance effectiveness is consistent with prior findings that emphasise the role of ICT infrastructure, system compatibility, and data integration in digital government performance (Abdullah & Haron, 2024; World Bank, 2024). Malaysia's relatively high level of broadband penetration and platform development provides a strong technological foundation for e-government services. Nevertheless, as noted by Yusof et al. (2023), disparities in system interoperability and legacy infrastructure continue to constrain seamless service delivery. The present findings confirm that technological readiness remains a necessary but not sufficient condition for effective e-governance, reinforcing arguments that technology must be complemented by organisational and institutional readiness.

At the user level, the significant effects **of** performance expectancy and facilitating conditions support the applicability of the UTAUT model in public-sector digital governance. Consistent with Venkatesh et al. (2003) and subsequent public-sector adaptations (Hržica et al., 2025), the findings indicate that when public officers perceive digital systems as useful and are provided with adequate technical and organisational support, they are more likely to utilise e-government platforms effectively. This is in line with empirical evidence from Malaysia showing that user perceptions of usefulness and access to support services drive sustained engagement with platforms such as MyGov Portal and online licensing systems (Yusof et al., 2023; Rahman et al., 2024). Importantly, this study demonstrates that user acceptance operates within an institutional context shaped by organisational capacity and policy coherence, thereby extending UTAUT beyond individual-level explanations.

Taken together, the findings contribute novel theoretical insight by empirically validating the integrated TOE–UTAUT framework in the Malaysian public-sector context. Unlike prior studies that examine organisational or user factors in isolation, this research demonstrates how organisational capability, policy support, technological readiness, and user acceptance jointly determine e-governance effectiveness under a nationally coordinated digitalisation agenda. This integrated perspective provides a more nuanced understanding of why digital transformation outcomes vary across public institutions, even within the same policy environment, and offers a transferable

analytical framework for other developing and middle-income countries pursuing state-led digital governance reforms.

Practical Implications

The findings have several implications for policymakers and practitioners in Malaysia's public sector. First, enhancing organizational capability should be prioritized through continuous digital skills development, leadership training, and performance-based incentives to cultivate innovation-driven cultures. Second, improving inter-agency interoperability and establishing common digital standards can strengthen environmental support, reducing duplication and fragmentation in service delivery. Third, expanding ICT infrastructure to cover remote administrative offices and leveraging cloud-based solutions will ensure inclusive access to e-services nationwide. Lastly, sustained investment in user support systems, such as digital literacy programs and technical assistance units, will encourage adoption and trust among public servants and citizens alike.

CONCLUSION

This study empirically examined the influence of digital transformation on e-governance effectiveness within Malaysia's public sector by integrating the Technology–Organization–Environment (TOE) and Unified Theory of Acceptance and Use of Technology (UTAUT) frameworks. Using data from 354 public officers across federal and state agencies in Putrajaya, Kuala Lumpur, and Selangor, the findings confirm that digital transformation significantly enhances e-governance outcomes in terms of efficiency, transparency, and citizen satisfaction. The combined model explains 68.1 percent of the variance in e-governance effectiveness, indicating a strong explanatory power.

Among the determinants examined, organizational capability emerged as the most influential factor, followed by environmental policy support, facilitating conditions, technological readiness, and performance expectancy. This suggests that while infrastructure and technology remain vital foundations, successful e-governance transformation ultimately depends on leadership commitment, institutional learning, and supportive policy environments. The integration of TOE and UTAUT further illustrates that effective digital transformation requires not only technological and organizational preparedness but also the perception of usefulness and supportive conditions that motivate user adoption and sustained engagement.

From a practical perspective, the study recommends that the Malaysian government intensify investments in public-sector digital capabilities by prioritizing leadership training, inter-agency collaboration, and comprehensive digital-skills programs. Strengthening interoperability frameworks and data-sharing policies will minimize fragmentation and foster efficiency across ministries. Moreover, enhancing user support mechanisms, such as technical help desks and continuous capacity-building workshops, will encourage sustained utilization of e-government systems. These actions are vital for realizing Malaysia's MyDIGITAL Blueprint (2021–2030) vision of a digitally empowered public sector.

From a theoretical standpoint, this study contributes to the growing body of digital-governance literature by empirically validating a multi-theoretical model that bridges organizational and behavioral perspectives. The TOE framework contextualizes structural readiness, while UTAUT explains individual acceptance together providing a holistic understanding of digital transformation dynamics within developing-country public sectors. Future research should adopt longitudinal or comparative designs across ASEAN nations to capture temporal changes and cross-national variations in digital-governance maturity. Hence, the findings reaffirm that digital transformation, when supported by robust institutional structures and user-centric adoption mechanisms, can significantly improve the quality, responsiveness, and inclusivity of public service delivery in Malaysia.

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