ASSESSING THE IMPACT OF DIGITAL TRANSFORMATION ON PUBLIC SECTOR EFFICIENCY: A STUDY OF E-SERVICE ADOPTION AND GOVERNMENT PERFORMANCE "

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Abstract
This study critically investigates the impact of digital transformation on public sector efficiency in Pakistan, with a particular focus on the adoption of e-services in Islamabad. Drawing on the Unified Theory of Acceptance and Use of Technology (UTAUT), the research explores how citizens' and government employees' perceptions of awareness, satisfaction, and performance shape the effectiveness of e-governance. Utilizing a quantitative approach, data was collected from 260 citizens and 220 public sector employees through structured Likert-scale surveys. Regression and ANOVA analyses reveal a statistically significant relationship between citizens' awareness and satisfaction with perceived quality of e-governance, underscoring the growing relevance of digital tools in improving transparency, responsiveness, and service delivery. However, a negative performance correlation from the employee perspective signals institutional inefficiencies, lack of training, and resistance to digital change. These findings highlight a duality: while citizens exhibit higher digital engagement, public institutions struggle to match technological capability with operational reform. The research underscores the need for integrated policy approaches that combine infrastructural investments with capacity-building and institutional accountability. By bridging empirical gaps in South Asian digital governance literature, this study provides actionable insights for enhancing the transformative potential of ICT in the public sector.

INTRODUCTION
In recent decades, the world has witnessed a significant transformation in governance driven by rapid advancements in Information and Communication Technology (ICT). E-governance has emerged as a pivotal tool for enhancing public sector efficiency, transparency, and accountability (Udoh, 2024). According to Chukwuemeka (2017),

ICT is one of the few forces in human history that has profoundly reshaped how institutions function. By digitizing public services and internal government operations, countries across the globe are striving to make governance more responsive to citizen needs (ANIGBATA). Kumbhar (2012) further notes that technological innovations have increased

competitiveness and professionalism in public administration, especially in service delivery (Sharma et al., 2015). In this context, digital transformation is not merely a technological shift but a governance reform aimed at improving efficiency, reducing corruption, and ensuring timely service delivery to the public (Shenkoya, 2023). E-services represent the practical application of e-governance, allowing citizens and businesses to access government services electronically. These digital platforms enable faster transactions, reduce the need for physical presence, and increase operational efficiency. Activities such as applying for identity documents, paying utility bills, filing taxes, and registering complaints can now be performed online, thereby minimizing bureaucratic delays (Hänninen, 2020). As argued by Dash (2016) and Chen (2006), the adoption of e-services fosters transparency by creating digital records and reducing human discretion, which in turn curbs opportunities for corruption. Moreover, e-services improve government responsiveness by enabling real-time tracking of requests and providing direct channels of communication between the public and authorities. These platforms also promote a more inclusive governance model by facilitating greater citizen engagement and participatory decision-making.

In Pakistan, efforts to digitize public services have gradually gained momentum over the past two decades. Shaikh et al. (2016) discuss the role of e-governance in improving public service delivery in Pakistan and the policy measures to remove the barriers that mar the reform efforts. The Ministry of Information Technology and Telecommunication (MoITT), established in 2000, initiated various digital governance programs to improve service delivery and administrative coordination (Latupeirissa et al., 2024). Islamabad, being the capital city, has been at the forefront of implementing these reforms. The Pakistan Citizen Portal, launched in 2018, is a key digital platform that allows citizens to file complaints and receive feedback from government departments, promoting transparency and accountability. Similarly, the e-Office system aims to streamline internal workflows within public institutions, thereby reducing paperwork, minimizing delays, and increasing overall efficiency.

However, challenges remain. Despite the potential of these initiatives, digital literacy gaps, institutional resistance to change, and inadequate infrastructure have hindered widespread adoption. Studies by Haider (2016) and Ali (2017) highlight that the success of e-governance in Pakistan is often limited by a lack of coordination among departments, minimal training of government staff, and low public awareness about available digital services. Nonetheless, Islamabad presents a relatively more favorable environment due to better internet access, higher digital readiness, and a more urbanized population. As such, it offers a unique setting to assess how digital transformation through e-service adoption can impact public sector performance (Malik, 2023).

1.1 Problem Statement:

Despite ongoing digitalization efforts in Islamabad, public sector efficiency and citizen satisfaction remain inconsistent. While global literature offers extensive analysis on the adoption of e-governance in developed countries, there is a noticeable gap when it comes to Pakistan, where empirical evaluations are limited and fragmented (Atique et al., 2024). A major concern is the lack of a unified model that guides the effective implementation of e-governance initiatives, resulting in varying outcomes and inefficiencies. Although e-government policies have been introduced, their actual impact on enhancing institutional performance and service delivery remains uncertain. In Islamabad, poor planning, misaligned resource allocation, and limited stakeholder engagement have further hindered the realization of tangible improvements (Aslam & Ansari). This study addresses the need to assess how e-services influence both operational efficiency within public institutions and the satisfaction levels of citizens. By examining the perspectives of government employees and service users, the research seeks to uncover the challenges, gaps, and potential strategies to strengthen the performance and responsiveness of Islamabad's public sector through digital transformation. This study explored the research questions that are mainly bases on to investigate the impact of e-services on government performance indicators such as transparency, responsiveness, and efficiency. Also to assess the

perception of public employees and citizens regarding the effectiveness of digital service delivery. In addition to this, it also focuses to explore the role of ICT in transforming public service delivery in the federal public sector

2. Literature Review
2.1 E-Governance and E-Services: Definitions and Evolution
E-Government refers to the use of information and communication technology (ICT) to enhance the access and delivery of government services to benefit citizens, businesses, and employees (Drew & J, 2011). The concept has evolved from basic digitization of public services to comprehensive digital transformation of governance structures. Alshehri and Drew (2010) explored fundamental aspects of e-government including its definitions, types (G2G, G2C, G2B, G2E), benefits, and constraints, underscoring that effective e-government aims to improve cost-quality ratios and transparency. However, challenges such as technological readiness, digital literacy, and institutional capacity still impede smooth implementation.

Globally, e-governance initiatives have shifted from mere automation to participatory and transparent governance, enabled through internet-based applications and platforms (Katebire, 2015). These transitions have facilitated improved access to information and encouraged civic participation. Holgersson (2014) emphasized that e-government also holds economic implications by reducing transaction costs, promoting transparency, and streamlining administrative procedures.

2.2 ICT and Public Sector Transformation
The integration of ICT into public sector operations has significantly reshaped bureaucratic processes, improving efficiency, reducing redundancy, and enhancing service delivery (Cordella & Tempini, 2015). (Baqir & Iyer, 2010) highlighted how the daily use of internet-based systems has transformed operations in both private and public sectors, enabling faster communication and service provision. ICT has also allowed for automation of routine processes, thereby minimizing human error and enhancing reliability. Hood (2010) and Hussain et al. (2024) noted that ICT-driven governance allows

public institutions to interact more directly with citizens, thereby reducing the inefficiencies associated with conventional bureaucracies. The use of digital platforms has empowered governments to better respond to citizen demands, while also improving data collection and analysis for informed policymaking. The need for innovative strategies to address technological and organizational barriers in public sector ICT implementation has been echoed in recent scholarship. Iqbal et al. (2024) emphasize that overcoming adoption challenges in digital ecosystems—such as infrastructural bottlenecks and staff resistance—requires contextualized innovation strategies, particularly in environments where institutional inertia is prevalent. Their findings from the SME sector offer relevant parallels for the public sector, reinforcing the argument that tailored interventions, capacity-building, and behavioral change initiatives are critical for successful digital adoption.

2.3 Performance Indicators in Public Administration
Performance in public administration, particularly within e-governance, is typically assessed through indicators such as service delivery speed, accuracy, cost-effectiveness, citizen satisfaction, and transparency (Khadka, 2024). ICT plays a critical role in enhancing these metrics by enabling real-time processing, digital record-keeping, and integrated service portals. (Al-Raisi, 2011) observed that digital systems facilitate performance monitoring and accountability, particularly when embedded with feedback and evaluation mechanisms. Furthermore, (Mishra, 2012) emphasized that performance improvement through ICT adoption is contingent upon appropriate legal frameworks and user readiness.

2.4 Global and Regional Studies on E-Governance
Comparative analyses indicate that countries vary widely in their adoption and implementation of e-government, often influenced by socioeconomic factors. Chen et al. (2006) examined e-governance in China, noting low development levels among local governments and uneven progress across ministries (Mishra, 2012). The study found that per capita GDP and education levels are critical determinants

of e-government success. In the South Asian context, particularly in Pakistan, e-government remains in a nascent stage. (Tabuga et al., 2020) noted that although the concept is gradually being embraced, infrastructural challenges, bureaucratic resistance, and low digital literacy hinder widespread adoption. (Wang et al., 2024)further pointed out that national information infrastructure needs restructuring, and there is a pressing need for integrated systems and change management strategies.

2.5 Theoretical Framework: Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) serves as a robust framework for analyzing user acceptance of e-governance services. It identifies four key constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions, which together influence behavioral intention and usage behavior (Venkatesh et al., 2008). In e-governance contexts, performance expectancy relates to perceived benefits such as time-saving or improved service delivery. Effort expectancy refers to the ease of use of digital platforms, while social influence examines peer and institutional encouragement. Facilitating conditions involve access to infrastructure and training. This model is particularly relevant in assessing citizen adoption of e-services in developing regions like Islamabad, where infrastructural and literacy barriers persist. Despite various initiatives, empirical evidence on the actual impact of e-governance on public sector performance in Pakistan remains limited. (Yueyang, 2024) observed that while digital platforms for taxes, education, and healthcare are being introduced, their usage and effectiveness are under-researched. Most existing studies focus on conceptual or qualitative analyses without robust empirical backing. Moreover, gaps persist in evaluating how these digital transformations affect administrative transparency, efficiency, and citizen satisfaction at the local government level. (Lal et al., 2024) argue that Pakistan requires more structured research on policy implementation and digital infrastructure development, particularly in underserved regions. These gaps necessitate a deeper investigation into the effectiveness of e-services in improving institutional

performance in Islamabad, which is the core objective of the current research.

3. Theoretical and Analytical Framework
3.1 Theoretical Background

The research draws on the Unified Theory of Acceptance and Use of Technology (UTAUT) model, developed by (Ashraf et al., 2022). This theory integrates insights from various technology acceptance models, including the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), and the Innovation Diffusion Theory (IDT), among others (Iyer, 2010). UTAUT focuses on four key factors that influence technology use: performance expectancy, effort expectancy, social influence, and facilitating conditions. These factors help assess technology acceptance and usage, which are essential for understanding e-service adoption in the public sector.

The theoretical model presented here is inspired by UTAUT, addressing both citizens' and employees' perspectives. According to the model, citizens' adoption of e-services is influenced by factors such as ease of use, security, and accessibility. For employees, key variables include supportive staff, computer self-efficacy, and training (Alfahid, 2020). The following sections explore how these theoretical elements apply to e-government service delivery, with an emphasis on citizens' and employees' experiences and satisfaction levels.Furthermore, Iftikhar et al. (2024) call for a more comprehensive and multidisciplinary understanding of digital transformation by integrating social innovation theories and technological adoption frameworks. Their proposed model redefines how innovation is conceptualized and operationalized in institutional settings, which supports the current study's emphasis on synthesizing both user-centric and institutional perspectives in the analytical framework.

3.2 Theoretical Models for E-Service Delivery

Two models are considered in the study: the model for citizens' perspectives and the model for employees' perspectives. The citizens' model focuses on ease of use, visual impact, security, and privacy as critical factors affecting their acceptance and use of e-services. These factors shape how citizens interact

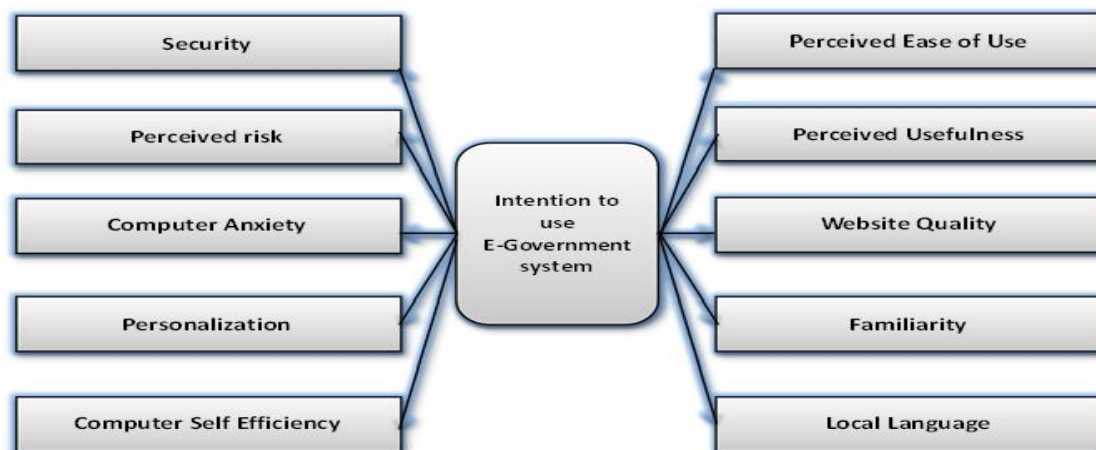with digital platforms and influence their satisfaction
(Taneja et al., 2021).

Fig. 1   Theoretical Model for Citizens' Perspectives

The employees' perspective model emphasizes the role of government workers in facilitating e-service delivery. It includes variables such as computer self-efficacy, supportive staff, and courtesy, which are critical for ensuring smooth e-service operations and enhancing citizens' satisfaction with the government services they receive (Iyer, 2010).
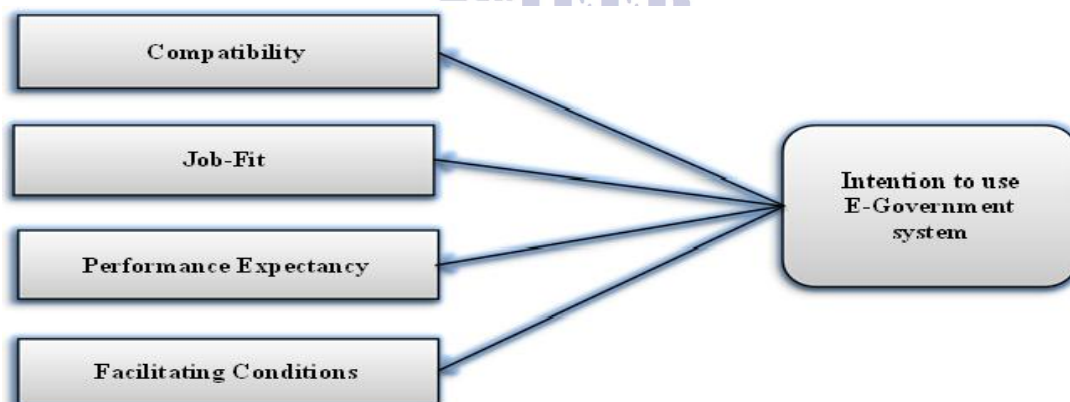

Fig.2   Theoretical Model for Employees Perspectives

3.3 Analytical Framework
The analytical framework for this research integrates the theoretical background with empirical studies, focusing on the relationship between e-service delivery and citizens' and employees' participation in the public sector. The framework emphasizes the importance of e-governance in improving service quality, citizen satisfaction, and government performance. It also highlights the role of awareness, satisfaction, and performance as central components that drive the quality of e-services provided by the federal government. In the context of Pakistan, the study examines how the delivery of electronic services influences citizen and employee satisfaction, as well as overall government performance. The framework aims to determine the factors that either hinder or facilitate the successful adoption of e-services (Persad & Padayacheey, 2015). The

theoretical models of citizens' and employees' perspectives inform this analytical approach, linking the operationalization of e-governance to actual service delivery and public sector performance.

To operationalize the analytical framework, the study explores the relationship between e-service providers (employees) and users (citizens). The key variables investigated include awareness, satisfaction, and performance. For citizens, awareness is shaped by factors such as ease of use, availability of information, and language accessibility. For employees, it is influenced by supportive staff, computer self-efficacy, and the level of courtesy shown in service delivery. Satisfaction is measured through variables like public acceptance, accessibility, and convenience for citizens, and efficiency of services, corruption propensity, and data security for employees. Performance is evaluated through citizens' perspectives of equity, participation, and responsiveness, alongside employees' perspectives on the rule of law, transparency, and accountability. This operationalization aims to bridge the gap between theoretical concepts and practical application, facilitating a comprehensive analysis of the impact of e-service adoption on public sector performance in Pakistan. The study will assess these variables across both employees and citizens to understand how each group contributes to the successful implementation of e-government services.

Quality e-governance refers to the efficient use of ICT by the government to enhance transparency, accountability, and service delivery. It aims to improve public sector operations and make government services more accessible to citizens. In the context of this research, quality e-governance is assessed based on the efficiency and user-friendliness of e-services, as well as the satisfaction of both citizens and employees with the digital services provided.

E-service adoption plays a crucial role in achieving quality e-governance, as it involves both the delivery of services by employees and the reception of these services by citizens. The study highlights how effective e-governance requires alignment between employees' roles and citizens' needs, ensuring that both parties are satisfied with the quality of services delivered. The relationship between employees and citizens in the context of e-service delivery is integral to ensuring the success of e-governance in Pakistan. In operationalizing the analytical framework, the study identifies key variables related to awareness, satisfaction, and performance for both citizens and employees. For citizens, awareness includes factors like ease of use, access to information, and the availability of local language options. For employees, it involves supportive staff, computer self-efficacy, and professional courtesy. Satisfaction is assessed through public acceptance, accessibility, and convenience for citizens, and through service efficiency, corruption levels, and data security for employees.
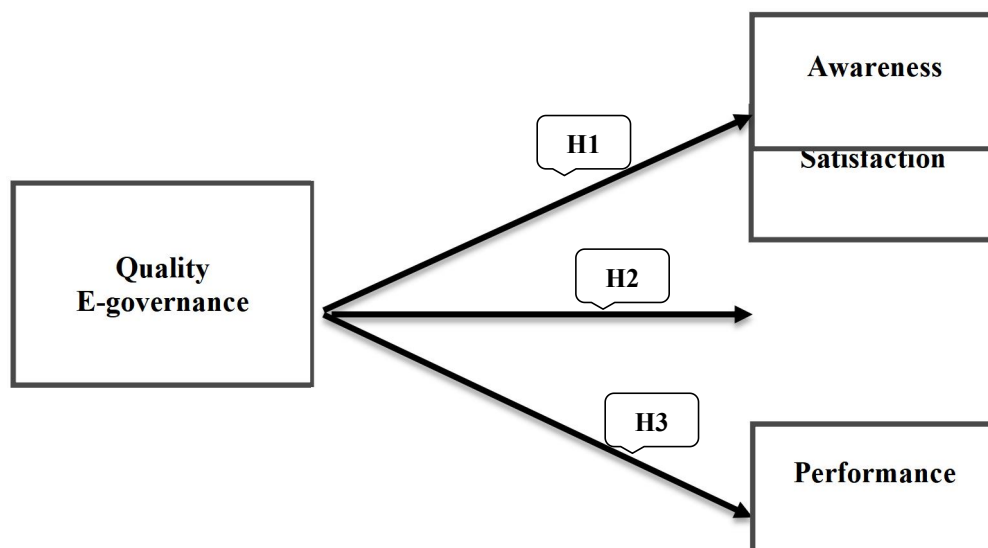

Fig 3 Analytical Framework

Performance is evaluated through citizens' perceptions of fairness, participation, and responsiveness in service delivery, as well as employees' views on legal frameworks, transparency, and accountability. These variables form the foundation for understanding the quality of e-governance in Pakistan and are critical in assessing the effectiveness of e-services and their impact on public sector performance.

4. Research Methodology

The research methodology for this study adopts a quantitative, deductive approach, focusing on a structured framework to assess the impact of e-service adoption and its influence on public sector efficiency. The study area is Islamabad Capital Territory (ICT), specifically targeting citizens across five key zones of the city and employees from selected federal government departments who utilize e-services. The research utilizes stratified random sampling within a convenience sampling framework to ensure diverse representation from both citizens and employees. Data collection will involve the use of structured Likert scale-based questionnaires, ensuring consistency in capturing responses from both groups. The study will rely on various statistical techniques, including Cronbach Alpha for reliability testing, correlation and regression analysis to explore relationships between variables, ANOVA for group comparisons, and factor analysis to identify underlying constructs related to e-service perceptions and usage.

The study aims to examine citizens' and employees' awareness, satisfaction, and performance regarding e-services provided through ICT applications in Islamabad. The research will focus on measuring the efficiency of these e-services and how well they align with citizens' needs and governmental performance. The population includes citizens of Islamabad, selected based on stratified sampling across different zones, and employees from key government offices, including NADRA, Excise & Taxation, and CDA. With the help of the structured questionnaires, this study will capture the impact of e-services on citizens' and employees' perceptions and satisfaction, assessing both the quality of governance and the overall effectiveness of e-governance initiatives. The results will contribute valuable insights into the role of e-services in enhancing public sector efficiency and the adoption process within Islamabad's government system.

5. Results and Analysis

5.1 Demographic Profile of Respondents

The study comprised 260 citizen respondents and 220 federal government employees in Islamabad. Among the citizens, the majority fell within the 35–45 age group (36.2%), followed closely by the 25–35 age bracket (33.5%). In terms of education, 40.8% were graduates, 29.2% held a master's degree, and only 7.3% had an M.Phil., indicating a high literacy rate (Table 4.1). Gender distribution was nearly balanced, with 53.5% males and 46.5% females. In contrast, among employees, 28.9% were aged 35–45 and 27.1% held a master's degree. Only 11.4% had attained an M.Phil., and the gender split showed 33.4% males and 29.4% females (Table 4.5).

Age Groups	
25 to 35	22.9 %
35 to 45	28.9 %
45 to above all	11.1 %
Educational Level	
Bachelors	24.3 %
Masters	27.1 %
M.Phil	11.4 %
Gender status	

Male	33.4 %
Female	29.4 %

5.2 Descriptive Statistics

Descriptive analysis revealed that citizens aged 25–35 were the most active users of e-services such as the Citizen Portal and NADRA facilities.

	Citizen's Perspective						
	Administrative Services		NADRA		E-Police		
	Citizen Portal	Domicile	CNIC	FRC	Incidents	Robbery	Character Certificate
25-35	23.70%	14.10%	19.30%	18.50%	11.90%	14.10%	11.90%
35-45	20.00%	16.30%	19.30%	17.00%	11.10%	17.00%	8.10%
above 45	12.60%	13.30%	14.80%	11.10%	5.90%	8.90%	11.10%

	Excise & Taxation			Municipal Cooperation Islamabad			
	Vehicles Registration	Vehicles Transfer	Vehicles Verification	Birth Certificate	Death Certificate	Water Billing	Property Tax
25-35	8.90%	14.80%	14.10%	8.10%	14.10%	8.90%	6.70%
35-45	8.90%	11.90%	15.60%	9.60%	11.10%	5.20%	10.40%
above 45	6.70%	7.40%	11.90%	6.70%	5.90%	5.20%	8.10%

		Utility Bills			
		IESCO	Sui Gas	PTCL	
	25-35	10.40%	14.80%	12.60%	
	35-45	11.90%	13.30%	11.10%	
	above 45	8.90%	6.70%	10.40%	

Younger users showed greater digital adaptability, with a notable 24.2% e-service usage rate in this group. Satisfaction levels varied across demographics; both genders reported high satisfaction, but a clear majority of women (33.3%) were more satisfied than men (28.9%) with e-services. However, satisfaction declined with age, as only 25.9% of respondents over 45 years expressed satisfaction. Among employees, convenience in delivering e-services remained a concern, with only 9.1% rating the services as highly convenient ,though over 53% agreed that e-governance increased service delivery efficiency (Table 4.7).

Implementation of e-governance system will increase the efficiency of employees	Frequency	Percent
Yes	118	53.64
No	102	46.36
Total	220	100

Regression analysis confirmed a strong positive relationship between awareness, satisfaction, and performance with quality e-governance from the citizen perspective. Awareness had the strongest effect (β = 0.2178), followed closely by satisfaction (β = 0.2099) and performance (β = 0.1403), with all p-values < 0.000, indicating statistical significance. The comparative analysis revealed stark contrasts in citizen and employee perceptions. Citizens demonstrated higher engagement and usage across multiple services, particularly in the 25–35 age group. While citizens associated performance positively with e-governance outcomes, employees' self-assessed performance showed a negative correlation, suggesting dissatisfaction or lack of preparedness in delivering e-services effectively (Table 4.12). Although both groups reported moderate to high satisfaction, the divergence in performance perception reflects implementation challenges within institutions.

One notable trend was the higher digital engagement of younger respondents, with awareness and satisfaction peaking in the 25–35 age bracket. Despite broad access to technology, older groups (above 45) showed both lower awareness and higher resistance to e-service adoption. An unexpected anomaly appeared in the employee dataset: while satisfaction and awareness correlated positively with e-governance, performance exhibited a negative impact (Table 4.14), likely due to inadequate training or resistance to change. This mismatch emphasizes the need for capacity-building initiatives to align service delivery with evolving digital platforms.

Source	SS	df	MS		F (3, 260)	=	2563.74
Model	5152.0757	3	1717.359		Prob> F	=	0.0000
Residual	12378.4482	18479	0.669866		R-squared	=	0.2939
Total	17530.5239	18482	0.948519		Adj R-squared	=	0.2938
					Root MSE	=	0.81845
Quality E-governance	coef.	std. Err.	T	P >] t]	[95% Conf.	Interval	
Awareness	0.2178602	0.013134	16.59	0.0000	0.192116	0.243604	
Satisfaction	0.2099309	0.01049	20.01	0.0000	0.189369	0.230449	
Performance	0.140396	0.010848	12.94	0.0000	0.119133	0.161659	
(Constant)	0.0546658	0.006033	9.06	0.0000	0.042841	0.066491	

The model's adjusted R^2 was 0.2938, meaning nearly 30% of the variation in perceived e-governance quality could be explained by these variables. For employees, awareness (β = 0.0192) and satisfaction (β = 0.0481) showed positive impacts, while performance had a significant negative effect (β = -0.1259), highlighting gaps in training and system familiarity.

Source	SS	df	MS		F(3, 220)	147.5
Model	432.639	3	144.213008		Prob> F	0.0000
Residual	23765	24306	0.977742135		R-squared	0.479
Total	24197.64	24309	0.995418954		Adj R-squared	0.478
					Root MSE	0.98881
Quality E-governance	coef.	std. Err.	t	P >] t]	[95% Conf.	Interval	
Awareness	0.019259	.0062937	3.06	0.0020	0.0069234	0.031595	
Satisfaction	0.048059	.0064431	7.46	0.0000	0.0354302	0.060688	
Performance	-0.12591	.006378	-19.74	0.0000	-0.1384117	-0.11341	
(Constant)	0.00232	.0063421	-0.37	0.0715	-0.0147506	0.010111	

The findings of this study reaffirm the relevance of the Unified Theory of Acceptance and Use of Technology (UTAUT) in understanding the adoption of e-services in the public sector. Citizens, particularly those in younger age groups with higher educational backgrounds, demonstrated greater awareness, satisfaction, and perceived improvements in service delivery. This aligns with prior research indicating that performance expectancy and effort expectancy are critical drivers of digital engagement. While both citizens and employees acknowledged the benefits of e-services in streamlining government operations, employees were less likely to report performance gains, highlighting institutional limitations in training, infrastructure, and organizational readiness.

E-services were generally seen as effective tools for promoting transparency, responsiveness, and administrative efficiency. However, despite strong policy-level emphasis on digital governance, a noticeable gap remains in practice. Challenges such as inconsistent ICT infrastructure, limited digital skills—especially among older staff and citizens—bureaucratic resistance to change, and concerns over privacy and data protection continue to hinder the full realization of e-governance goals. These obstacles indicate that while digital tools are in place, their optimal utilization is still constrained by systemic issues.

6. Conclusion and Future Research
This study provides empirical insights into the relationship between digital transformation and public sector efficiency in Islamabad, Pakistan. By examining the adoption and impact of e-services from both citizen and government employee perspectives, the research reveals a nuanced digital governance landscape. While citizens—particularly younger, digitally literate individuals—exhibit high levels of awareness and satisfaction with digital services, public sector employees display relatively lower perceptions of performance, indicating internal institutional gaps. The findings affirm that digital transformation enhances transparency, accessibility, and responsiveness in service delivery. However, these benefits are not evenly distributed due to infrastructural limitations, resistance to change, and a lack of digital capacity within government institutions.

The study underscores that e-governance cannot succeed through technological implementation alone. Institutional readiness, staff training, stakeholder engagement, and supportive policy frameworks are equally essential. The identified divergence in performance perceptions between citizens and employees indicates that without parallel investment in human capital and change management, the full potential of digital governance will remain unrealized. Thus, a holistic and context-sensitive approach is needed to sustain and scale digital public services in developing countries like Pakistan.

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