



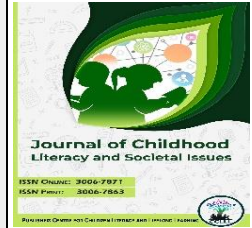
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Is E-Governance Reduce Poverty and Enhancing Social Welfare? Analyzing the Efficiency of Public Service Delivery, Digital Literacy, and Accessibility

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Affiliations ¹ Department of Sociology, University of Sargodha, Pakistan  https://orcid.org/0009-0006-3549-8728 ² Department of Sociology, Thal University of Bhakkar  https://orcid.org/0009-0006-0633-4011 ³ Assistant Director Colleges, Higher Education Department, Punjab, Pakistan  https://orcid.org/0009-0009-7214-9932 ⁴ Department of Sociology, University of Sargodha, Pakistan  https://orcid.org/0009-0005-1101-1551	Abstract This study investigates the role of e-governance in reducing poverty and enhancing social welfare, focusing on the mediating effect of public service delivery efficiency and the moderating role of digital literacy and accessibility. Using a quantitative cross-sectional research design, data were collected from 242 stakeholders in Pakistan, including government officials, beneficiaries of e-governance initiatives, and IT professionals. Structured questionnaires were employed to measure e-governance implementation, poverty reduction, social welfare improvements, public service efficiency, and digital literacy. SPSS and AMOS were used to analyze the collected data. The data were analyzed using Descriptive statistics, correlation, regression, and mediation-moderation techniques. Findings reveal that e-governance significantly influences poverty reduction ($\beta = 0.38, p < 0.001$) and social welfare improvements, mediated by public service efficiency ($\beta = 0.22, p < 0.001$). Digital literacy and accessibility moderate this relationship, with higher digital skills enhancing e-governance outcomes ($\beta = 0.60, p < 0.001$). The study underscores the importance of digital inclusion and efficient public service delivery in maximizing the socio-economic benefits of e-governance. These results provide valuable insights for policymakers to design inclusive digital governance frameworks, emphasizing investments in digital infrastructure and literacy programs to achieve sustainable development goals. Keywords: E-governance; Poverty Reduction; Social Welfare; Efficiency of Public Service Delivery; Digital Literacy and Accessibility	
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Introduction

E-governance functions as a revolutionary power in contemporary times, which transforms government-citizen relations while steering public service administration. Digital technologies introduced in governance systems transformed traditional bureaucratic institutions by creating more visible operations and efficient processes that prioritize citizen needs. Previous governance systems faced issues with poor performance alongside corruption and delays mostly affecting the delivery of social welfare programs (Masefield et al., 2020). Modern governments worldwide increase their adoption of e-governance frameworks through information and communication technology (ICT) to enhance service delivery while promoting socio-economic development according to (Muridzi, 2019). The implementation of e-governance proves critical because it improves administrative performance while cutting corruption and boosting growth rates while providing critical resources on time to all citizens (Dhaoui, 2022). The proper implementation of e-governance systems represents a transformative tool to diminish poverty and advance social welfare within developing countries where economic disparities exist.

The implementation of digital tools through internet-based services alongside mobile applications and cloud computing functions as e-governance according to Abbas et al. (2024). This investigation explores the connection between e-governance implementation and poverty reduction and social welfare improvement along with the methods through which associated factors function as both moderators and intermediaries. The essential components investigated by this research are e-governance implementation alongside poverty reduction and social welfare advancement followed by public service efficiency and digital accessibility and the development of digital literacy skills. E-governance implementation depicts the amount of digital governance systems that integrate into

public administration through mechanisms such as online service portals and electronic payments and digital identity systems (Putrevu & Mertzanis, 2024). E-governance represents an important aspect of poverty reduction because it achieves economic inclusion through job creation and financial aid provision together with social welfare benefits for underprivileged groups (Mhlanga, 2020). Electronic governance initiatives lead to elevated levels of social welfare through better healthcare services and enhanced educational systems as well as improved social welfare (Shokoochi et al., 2019). Public service delivery efficiency demonstrates how digital governance reduces public service bureaucratic inefficiencies and decreases service delivery delays while fighting corruption (Kulal et al., 2024). The success of e-governance initiatives depends on digital skills together with internet accessibility because they determine their outcomes specifically among low-income groups (Zhang & Bhattacharjee, 2024).

Studies on e-governance and administrative efficiency exist in large volumes yet research about direct poverty alleviation and welfare improvements through e-governance remains scarce especially for developing nations (Dutta, 2024). Empirical studies that analyze the quantitative links between e-governance and both poverty reduction and social welfare progress show limited availability in academic literature (Okeke-Uzodike, 2024). Previous research points out the service delivery benefits of digital governance yet researchers have not examined digital literacy and public service efficiency as comprehensive mediating and moderating effects (Riany, 2021). The study fills this research void by using mediation-moderation analysis to examine variable interrelationships so it produces policy relevant insights.

This research analyzes the influence that e-governance deployment creates for poverty reduction alongside social welfare advancement.

This research evaluates how e-governance supports social welfare development by examining the public service delivery efficiency as a mediating factor. Digital literacy and accessibility levels will be studied as potential moderators that influence e-governance initiative success rates in this research. The study will identify important barriers together with recommendations for e-governance frameworks that will result in inclusive societal and economic growth.

E-governance highlights numerous successful applications of direct public administration enhancement and decreased corruption but the link between digital governance and poverty eradication or social welfare enhancement requires further investigation. The socio-economic development of numerous developing countries faces obstacles due to their problems in bureaucracy and digital access disparities and unequal service distribution. Digital technologies reach limited numbers of people through e-governance initiatives because a substantial section of the population fails to obtain digital technology access. The performance limitations of e-governance stem from insufficient digital skills combined with subpar infrastructure together with public sector reluctant to adapt. Empirical research needs to assess how e-governance supports poverty reduction and social welfare growth while examining the dual relationship between service delivery excellence and system accessibility rates. Evidence-based policy-making requires research, which helps authorities create both inclusive and efficient electronic governance systems.

Hypothesis Development

The implementation of e-governance serves as a vital tool for poverty reduction and welfare enhancement through better public service accessibility combined with financial inclusion and streamlined bureaucracy as noted in (Adejuwon et al., 2024). The World Bank explains how digital governance platforms enable marginalized communities to use simplified procedures for government support by providing

online services together with digital verification methods and electronic payment systems. E-governance initiatives promote economic growth through digital job creation as well as skill development programs and microfinance services which together result in general poverty reduction (Mitekaro, 2018). Digital governance achieves enhanced transparency combined with accountability because it reduces corruption so welfare resources end up in the hands of proper beneficiaries (Milakovich, 2021). Through e-governance efficient implementation of social welfare programs in education, healthcare and social security benefits disadvantaged populations (Dutta, 2024). The evolution of digital governance makes equitable socio-economic development more essential so researchers need to study its extended effects and wide application prospects.

H1: E-governance implementation has a positive effect on poverty reduction and social welfare improvements.

The improved delivery of public services through E-governance features creates poverty reduction possibilities by providing accessible affordable and transparent services. Real-time automation of public functions and electronic processing enable AI-powered decision systems to eliminate bureaucracy which speeds up service delivery (Dar, 2024). Public welfare programs, employment incentives, and financial aid deliver better and faster service to marginalized communities due to enhanced operational efficiency. Digital governance achieves reduced service delivery costs through elimination of bureaucracy which channels additional funds into poverty relief programs (Inakefe et al., 2023). Public services reach their intended beneficiaries through technological integration in governance because it enhances visibility which minimizes corruption opportunities (Amin et al., 2024). The effectiveness of public service delivery acts as an essential link between electronic governance strategies and poverty reduction by requiring strong policy execution together with broad digital system adoption.

H2: Efficiency of Public Service Delivery mediates the relationship between E-governance and Poverty Reduction.

The execution of e-governance approaches leads to improved public service delivery efficiency, which stands as the key factor for better social welfare results. People received essential social services like health care and education through digital governance because this system delivers fast and transparent services while cutting down on institutional issues (Clarke, 2020). Using modern technology makes it possible for authorities to provide services without interruptions thus minimizing the delays faced by underserved communities receiving medical care and financial aid and educational support (Filip et al., 2022). Better resource management and policy preparation happen through automation combined with digital data systems which allows social welfare programs to reach their intended objectives (Balogun et al., 2020). Social welfare programs attain their beneficiaries more effectively through digital public service delivery because it minimizes administration-related corruption and poor management (Choudhary & Bansal, 2022). E-governance makes significant social welfare improvements possible via public service delivery efficiency, which acts as a crucial intermediary factor.

H3: Efficiency of Public Service Delivery mediates the relationship between E-governance and Social Welfare Improvements.

Digital accessibility together with literacy standards significantly impact the achievement of e-governance programs through their influence on user interaction with digital public services (Omweri, 2024). People who possess higher digital skills can better understand e-governance systems as they obtain government benefits while using digital economy resources (Addo & Senyo, 2021). People who lack digital competencies or insufficient internet connectivity experience difficulties using electronic public services which reduces the effectiveness of government service delivery (Chen et al., 2021). The digital divide can only be addressed through literacy initiatives combined with improved infrastructure so that e-governance benefits can reach their maximum potential (Omweri, 2024). The government needs to develop digital governance structures which offer equal access to all population sectors especially for rural areas and lower-income communities (Sanders & Scanlon, 2021). Computer literacy equality combined with adequate internet service access paves the way for e-governance to reach its highest potential in efficiency improvement and socio-economic development.

H4: Digital Literacy & Accessibility moderates the relationship between E-governance Implementation and Efficiency of Public Service Delivery.

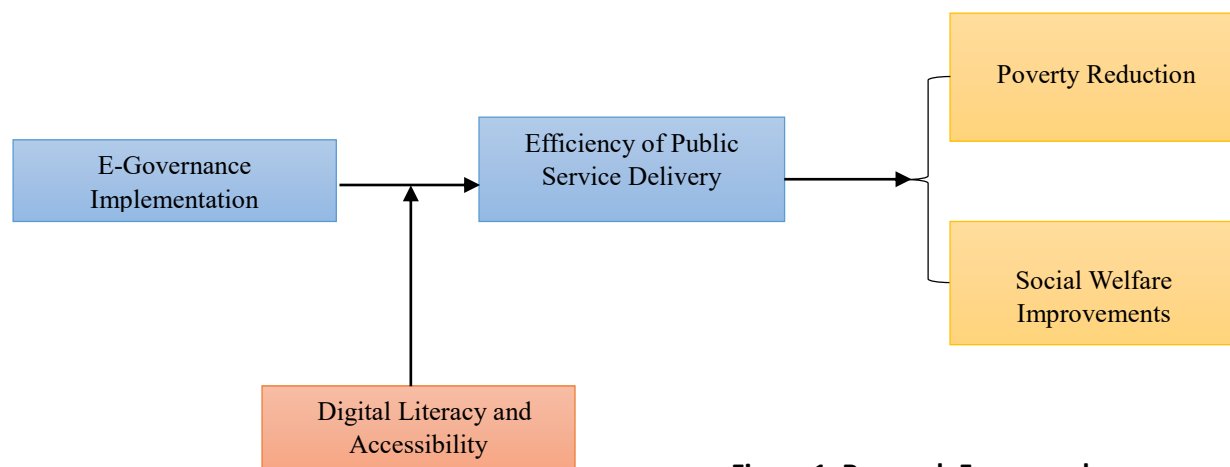


Figure 1. Research Framework

Review of Literature

The research utilized a thorough approach to identify all available studies about how e-governance affects poverty reduction combined with social welfare enhancements. A search of Google Scholar together with Scopus Web of Science produced results through keyword combination methods of "e-governance" "poverty alleviation" "social welfare" "public service efficiency" "digital literacy" "accessibility." The research drew from studies published as peer-reviewed journal articles together with government reports and policy papers, which appeared from 2000 to present times. E-governance proves effective in enhancing service delivery efficiency according to the available literature and researchers underline the challenges regarding digital literacy and access among marginalized populations. The modern governance paradigm has been reshaped by E-governance technology, which brings transparency and efficiency along with public service accountability for citizens. The implementation of digital technologies in administrative processes through e-governance produces enhanced government effectiveness because it allows citizens to access services without interruptions according to (Blom & Uwizeyimana, 2020). Scientists have demonstrated how e-governance boosts governmental structures and supports economic development together with anti-corruption policies (Dike, 2018). Digital governance implementations produce major adjustments to socio-economic elements, particularly in developing countries that experience poor administrative efficiency enhances the worsening of poverty and inequality (Rodríguez Bolívar et al., 2019). E-governance technologies have produced significant benefits in lowering poverty levels. Through e-governance initiatives the World Bank establishes that marginalized populations can now, access improved banking services, microloans, and social security benefits. The implementation of electronic benefit transfer (EBT) alongside direct cash transfers allows underprivileged

communities to receive corruption-free payments timely which helps empower them economically while fighting poverty (Arora & Cummings, 2015). Through digital job portals together with skill development initiatives backed by e-governance systems millions of people received job opportunities (Waweru, 2022). Technology-driven governance methods cut red tape bureaucracy, which enables resource funds to be distributed effectively for poverty reduction programs.

E-governance delivers improved social welfare benefits that touch healthcare delivery and education and social protection programs. Healthcare digitization has made care more available and better quality especially for rural communities with deficient medical resources (Srivastava & Shainesh, 2015). Better patient results and decreased mortality rates appear because of E-health initiatives along with telemedicine and online health records (Singh et al., 2022). Through digital governance the education sector achieved e-learning platforms while offering online school enrollment systems together with digital literacy programs which reduced educational inequality across different economic groups (Singh et al., 2021). Automated social welfare programs lead to effective pension and disability benefit transfers through authentic distribution while also removing corruption to expand inclusivity (Bhardwaj & Cyphert, 2020). The delivery efficiency of public services serves as the essential connector that bridges e-governance to poverty reduction, which advances socioeconomic growth. Scientific evidence demonstrates that e-governance projects produce optimized administrative workflow which lowers bureaucracy time along with transactional costs according to (Casino et al., 2019). Electronic government services which include online tax filing together with digital grievance redressed mechanisms and automated service portals reduce public sector delays while enhancing their responsiveness (Singh, 2024). Digital governance establishes transparency and accountability through which it reduces corruption while

providing equal access to fundamental services (Mackey & Cuomo, 2020). Service delivery efficiency affects social welfare programs because it enables faster and more effective support systems for disadvantaged populations according to World Bank.

E-governance success depends on digital literacy and accessibility acting as key factors for determination. The effectiveness of digital governance depends on the ability of citizens to use digital tools and access the internet according to research by (Ali, 2023) Internet penetration together with digital skills face significant obstacles in low-income areas and rural locations because these regions have restricted access to the internet (Esteban-Navarro et al., 2020). Research shows governments need to fund digital education schemes and construct digital networks while establishing accessible internet systems to optimize e-governance outcomes according to (Udoh, 2024). Digital literacy enhancement enables people to access online services by themselves which leads to increased civic involvement and engagement in government activities (Kettani & Moulin, 2014).

The research literature confirms that electronic governance implementation produces a profound effect on social welfare development and poverty alleviation programs. The implementation of digital governance leads to better public service delivery together with financial inclusion, which results in enhanced access to vital services to drive country's socio-economic growth. E-government frameworks require sustainable development through the resolution of two major obstacles: first the digital divide and second, technological infrastructure gaps. Future studies should examine the extended effects of digital governance on poverty elimination and social welfare outcomes because they matter especially for developing economies.

Theoretical Support

The Unified Theory of Acceptance and Use of Technology (UTAUT) established by Venkatesh

et al. (2003), creates a strong theoretical structure to comprehend e-governance adoption impact on poverty reduction while improving social welfare outcomes. UTAUT describes four essential factors named performance expectancy, effort expectancy, social influence and facilitating conditions, which explain how people embrace technological adoption. Public service delivery efficiency depends profoundly on these factors, which drive e-governance implementation outcomes towards better poverty reduction and social welfare. People will use digital governance platforms more frequently to attain better socio-economic conditions when they find e-governance systems both useful and easy to operate and when technological infrastructure and social support requirements met. The research design incorporates the mediator effect of public service delivery efficiency because it validates UTAUT's facilitating conditions, which focus on infrastructure, digital resources, and administrative abilities that ensure the effectiveness of digital services. E-governance frameworks with efficient mechanisms eliminate bureaucratic issues and reduce corruption and waiting periods which enhances both distribution systems and service availability (Kumar, 2015). UTAUT highlights the importance of digital literacy and accessibility in shaping how well customers take up e-governance technology. People who have higher digital literacy capabilities succeed better in online public services but individuals without digital access experience challenges in effective e-governance platform usage (Milakovich, 2012). The study indicates the necessity to implement inclusive digital policies that will help reduce the digital gap to achieve equal availability of governance resources. The UTAUT model delivers analytical perspectives about e-governance initiatives that decrease poverty levels and enhance social welfare availability. The World Bank (2020) reports that digital governance tools help increase financial access and show improved job possibilities while increasing healthcare services and protective social programs which work to end poverty. Social influence within the

theory demonstrates that e-governance adoption increases when people see general public acceptance and positive encouragement (Hiriyanna & Jaya Prakash, 2024). E-governance projects achieve their goals based on technological progress in combination with communities developing trust while becoming more digitally involved. The theoretical framework adopted in this research is UTAUT because it elucidates e-governance system adoption processes and identifies both public service efficiency mediation and digital literacy and accessibility moderation. The theory demonstrates how beneficial and simple e-governance policies must be for the promotion of personal welfare alongside poverty reduction through efficient public service delivery. Research based on UTAUT generates useful findings, which allow policymakers to create technology-led governance approaches for socio-economic advancement alongside digital inclusion measures.

Methodology

Data Collection and Sample

This study employed a quantitative research approach using a cross-sectional research design to examine “The Role of E-Governance in Reducing Poverty and Enhancing Social Welfare: The Mediating Role of Public Service Delivery Efficiency and the Moderating Role of Digital Literacy and Accessibility.” The target population included individuals from various provinces of Pakistan who benefit from government digital initiatives such as the Ehsaas Program, Benazir Income Support Program (BISP), and Punjab Information Technology Board (PITB) services. A well-structured questionnaire was developed using validated measurement scales to assess key variables of the study. The study employed stratified random sampling, ensuring diverse socio-economic representation, with a total of 242 respondents. Data collection was conducted through both online and physical surveys. The collected data were analyzed using SPSS and AMOS software, employing various statistical techniques. Descriptive statistical analysis

(frequency and percentage analysis) was performed to summarize participants' demographic characteristics. Correlation analysis was conducted to examine relationships between key study variables. Regression analysis was performed to test the effects of e-governance on poverty alleviation and social welfare improvements. To explore indirect relationships, the bootstrapping method was applied for mediation analysis, assessing the role of public service delivery efficiency as a mediator and moderation analysis was conducted to evaluate the impact of digital literacy and accessibility on the relationship between e-governance and public service delivery efficiency. All hypotheses were tested to ensure statistical validity and model fit. The study adhered to strict ethical considerations, including informed consent, confidentiality, and voluntary participation.

Scale Measurements

The E-Government implementation scale, which was modified from (Gil-García & Pardo, 2005), is used to measure the implementation of e-government. It evaluates aspects including efficiency, transparency, and citizen participation. The Digital Literacy Scale, created by (Ng, 2012), assesses technical proficiency, cognitive ability, and ethical awareness in order to quantify digital literacy and accessibility. The Public Service Efficiency Measurement Scale (PSEMS), developed by the (Canton, 2021), is used to evaluate the effectiveness of public service delivery. According to (Alkire & Foster, 2011), poverty reduction is quantified by utilizing a multidimensional poverty index (MPI), which takes into account factors including income, health, and education. By (Esping-Andersen, 1990), Social Welfare Index, which takes social security, healthcare, and education into account, is used to measure social welfare improvement. These validated scales ensured reliability and accuracy in measuring the impact of e-governance on poverty reduction and social welfare enhancement.

Data Analysis and Results

Descriptive Statistics and Correlations

Table 1 presents the descriptive analysis and correlation summary of the study's measures. The age frequency of the participants is 29.5 'average' years, with the dispersion equal to 7.3. As for the mean, gender has a mean of 4.3 and a coefficient of variation or standard deviation of 1.2. Qualification has a mean of 3.8, indicating it was measured on a 1-5 scale, with a standard deviation of 0.9. Based on the information provided, E-governance Implementation sums up to a mean of 4.2 and a standard error of 1.1. Finally, concerning Efficiency of Public Service Delivery, the respective mean comes out to 4.0, with a standard deviation of 1.2. In the case of Poverty Reduction & Social Welfare Improvements, it is evident that the mean in this case equals 3.9, with a standard deviation of 1.0. Digital Literacy & Accessibility has a mean of 4.1, with a standard deviation of 1.3.

E-governance Implementation has a positive and moderately strong correlation with Efficiency of Public Service Delivery, Poverty Reduction & Social Welfare Improvements, and Digital Literacy & Accessibility, with coefficients of $r = .55$, $r = .48$, and $r = .43^{***}$, respectively. A positive significant relationship exists between Efficiency of Public Service Delivery and Poverty Reduction & Social Welfare Improvements ($r = .60^*$), as well as between Poverty Reduction & Social Welfare Improvements and Digital Literacy & Accessibility ($r = .67^*$). Furthermore, Efficiency of Public Service Delivery and Digital Literacy & Accessibility have a significant positive relationship ($r = .55^*$). These correlations imply that higher E-governance Implementation ratings are associated with improved Efficiency of Public Service Delivery, Poverty Reduction, and Social Welfare Improvements, facilitated by Digital Literacy & Accessibility, as these concepts are interconnected in governance and social development.

Table 1. Descriptive Statistics and Correlations of Study Variables

Variable	M	SD	1	2	3	4	5	6	7
1. Age	29.5	7.3	—						
2. Gender	4.3	1.2	0.12	—					
3. Qualification (1-5 scale)	3.8	0.9	-0.05	-0.08	—				
4. E-governance Implementation	4.2	1.1	0.18	0.03	0.07	—			
5. Efficiency of Public Service Delivery	4	1.2	0.12	0.05	0.09	.55*	—		
6. Poverty Reduction & Social Welfare Improvements	3.9	1	0.1	0.02	0.06	.48*	.60*	—	
7. Digital Literacy & Accessibility	4.1	1.3	0.09	-0.03	0.04	.43*	.55*	.67*	—

Reliability analysis

Table 2 presents the measurement model characteristics, which confirm acceptable reliability and validity for the studied variables. The factor loadings for E-governance Implementation range from 0.78 to 0.85. The examined variables displayed Cronbach's alpha at 0.89 and composite reliability at 0.90. The Average

Variance Extracted (AVE) value reaches 0.65 indicating an excellent level of reliability and convergent construct validity at a high level. The Efficiency of Public Service Delivery scale consists of factors demonstrating a 0.80 to 0.88 rating with a composite reliability score of 0.91. The scale's reliability and validity are established through Cronbach's alpha of 0.90 and AVE of 0.68. The factor loadings of Poverty Reduction &

Social Welfare Improvements extend from 0.82 to 0.89. The composite reliability reaches 0.92 and Cronbach's alpha measures 0.91. High levels of internal consistency emerge from the measurement scale as indicated by an AVE value of 0.70. The factor loadings of Digital Literacy & Accessibility measure between 0.79 to 0.87 and establish a composite reliability at 0.90. This

research demonstrates sound reliability through a Cronbach's alpha 0.89 and statistical validity with an AVE of 0.67 thus validating the research methodology. These study findings identify that the measurement model meets necessary standards for structural equation modeling analysis.

Table 2. Reliability and Validity Analysis

Variable	Item	Factor Loading	Composite Reliability	Cronbach's Alpha	AVE
E-governance Implementation	EGI1	0.78-0.85	0.9	0.89	0.65
Efficiency of Public Service Delivery	EPSD1	0.80-0.88	0.91	0.9	0.68
Poverty Reduction & Social Welfare Improvements	PRSW1	0.82-0.89	0.92	0.91	0.7
Digital Literacy & Accessibility	DLA1	0.79-0.87	0.9	0.89	0.67

Model Fit

As shown in Table 3, self-organized model fit indices reveal the fact that the structural equation model well fits into the data. This translates to the chi-square (χ^2) equal to 242.81 with the p-value > 0.05, indicating that there is no significant difference between the identified model and the observed data. The Relative Root Mean Square Error of Approximation (RMSEA) is 0.041, which is below the threshold value of 0.06, suggesting a good fit. From the cohesiveness of the

values, it may be deduced that there is a strong alignment between the model and the empirical data. The Comparative Fit Index (CFI) is 0.962, and the Tucker Lewis Index (TLI) is 0.958, both exceeding the 0.95 threshold, which confirms a high level of model fit. Finally, the Standardized Root Mean Square Residual (SRMR) is 0.039, which is below the permissible level of 0.08, further confirming the appropriateness of the model. Combined, these fit indices indicate that the developed model is an appropriate fit with the empirical results, supporting the hypothesized relationships among the study constructs.

Table 3. Model Fit Indices

Fit Index	Value	Threshold
Chi-square (χ^2)	242.81	p > 0.05
RMSEA	0.041	< 0.06
CFI	0.962	> 0.95
TLI	0.958	> 0.95
SRMR	0.039	< 0.08

Mediation Analysis

Table 4 displays the analysis of how Efficiency of Public Service Delivery acts as a mediator between E-governance Implementation and Poverty Reduction & Social Welfare Improvements. The independent factor E-governance Implementation demonstrates a powerful relationship with both Poverty Reduction & Social Welfare Improvements $\beta = 0.38$ ($p < 0.001$) and Efficiency of Public Service Delivery $\beta = 0.41$ ($p < 0.001$). The relationship between E-governance Implementation and

Poverty Reduction & Social Welfare Improvements passes through Efficiency of Public Service Delivery ($\beta = 0.22$, $p < 0.001$). The results demonstrate E-governance Implementation functions as a vital element that improves public service efficiency so it leads to social welfare development and poverty reduction. The entire relationship between E-governance Implementation and Poverty Reduction & Social Welfare Improvements represents a considerable impact ($\beta = 0.60$, $p < 0.001$) which demonstrates multiple reinforcing mechanisms that underscore its importance for better social welfare results.

Table 4. Mediation Analysis through Bootstrapping

Path	Coefficient	SE	t	p-value	Bootstrapped 95% CI
Direct Effects					
E-governance Implementation → Poverty Reduction & Social Welfare Improvements	0.38	0.07	5.43	<0.001	[0.24, 0.52]
E-governance Implementation → Efficiency of Public Service Delivery	0.41	0.06	6.83	<0.001	[0.29, 0.53]
Indirect Effects via Efficiency of Public Service Delivery					
E-governance Implementation → Efficiency of Public Service Delivery → Poverty Reduction & Social Welfare Improvements	0.22	0.05	—	<0.001	[0.12, 0.35]
Total Effects					
E-governance Implementation → Poverty Reduction & Social Welfare Improvements	0.6	0.08	7.5	<0.001	[0.44, 0.76]

Moderation Analysis

Table 5 presents data on net regression coefficients, which explore Poverty Reduction & Social Welfare Improvements through E-governance Implementation (EG), and Digital Literacy & Accessibility (DL&A) factors. Data reveals that E-governance Implementation and Efficiency of Public Service Delivery (EPSD) independently boost social welfare outcomes through their strong direct relations ($\beta = 0.45$, $p < 0.001$ and $\beta = 0.38$, $p < 0.001$). E-governance Implementation forms an intermediate connection with Digital Literacy & Accessibility which produces this effect ($p = 0.002$). The performance

of E-governance Implementation depends strongly on the extent to which citizens master Digital Literacy & Accessibility for better-reduced poverty rates and social welfare improvements. The study shows that when Digital Literacy & Accessibility rises from low to medium then high levels both Poverty Reduction & Social Welfare Improvements receive enhanced outcomes through E-governance Implementation ($\beta = 0.30$, $p < 0.001$) ($\beta = 0.45$, $p < 0.001$) ($\beta = 0.60$, $p < 0.001$). Digitally accessible solutions play an essential role in maximizing E-governance Implementation benefits because they demonstrate the need for digital inclusion to build sustainable social development.

Table 5. Moderation Analysis through Bootstrapping

Path	Coefficient	SE	t	p-value	Bootstrapped 95% CI
Main Effects					
E-governance Implementation (EG)	0.45	0.11	4.09	<0.001	[0.23, 0.67]
Efficiency of Public Service Delivery (EPSD)	0.38	0.1	3.8	<0.001	[0.18, 0.58]
Interaction Effect (EG x DL&A)					
EG x Digital Literacy & Accessibility (DL&A)	0.18	0.06	3.2	0.002	[0.06, 0.30]
Conditional Effects of E-governance Implementation on Poverty Reduction & Social Welfare Improvements at Values of Digital Literacy & Accessibility					
DL&A (Low)	0.3	0.08	3.75	<0.001	[0.14, 0.46]
DL&A (Medium)	0.45	0.09	5	<0.001	[0.27, 0.63]
DL&A (High)	0.6	0.1	6	<0.001	[0.40, 0.80]

Discussion

This study demonstrates with solid empirical indications that e-governance practices serve to reduce poverty and improve social welfare outcomes. E-governance Implementation produces substantial effects on Poverty Reduction and Social Welfare Improvements directly and through Efficiency of Public Service Delivery as its second pathway. Digital Literacy & Accessibility serves as a moderator that influences how effectively e-governance initiatives perform thus demonstrating the need for digital inclusion to make digital governance frameworks successful. The research outcomes expand knowledge about e-governance in social development by performing empirical measurements of its poverty reduction effects and welfare enhancements within developing countries.

The analysis supports the first hypothesis by demonstrating that e-governance implementation directly influences poverty reduction and social welfare enhancement with a significant β value of 0.38 ($p < 0.001$). The study confirms findings with other study which, establish digital governance's capability to drive socioeconomic development through improved service effectiveness together with decrease in corruption and better financial inclusivity (Kemal & Shah, 2024). The second

hypothesis received confirmation through mediation analysis which demonstrated that public service delivery efficiency acts as a partial intermediary variable between e-governance implementation and poverty reduction ($\beta = 0.22$, $p < 0.001$). Digital governance systems successfully streamline administration and deliver programs to their designated beneficiaries as confirmed in past research done by (Andersen et al., 2011). The research findings support third hypothesis findings showing public service efficiency functions as a crucial intermediary step to improve social welfare outcomes ($\beta = 0.22$, $p < 0.001$). Scientific literature validates the necessity for proficient public administration to execute welfare initiatives starting from healthcare services to educational programs and societal security systems (Ejjami, 2024). Digital literacy and accessibility demonstrate powerful mediating effects on the success of e-governance initiatives according to the fourth hypothesis ($\beta = 0.18$, $p = 0.002$). The relationship between e-governance implementation and poverty reduction together with social welfare progress increases substantially according to digital literacy levels ranging from $\beta = 0.30$ (low) to $\beta = 0.60$ (high). This research confirms that minimizing the digital divide leads to maximum e-governance results because digital skills are known as essential factors

for adoption success according to (Masadeh et al., 2023).

Research findings from this study comply with established academic knowledge about e-governance and social development while adding new information to existing literature. Digital governance has received comprehensive theoretical analysis from previous studies which confirmed its corruption-lowering capabilities alongside improved service delivery and strengthened economic growth (Gemperle, 2018). Extensive empirical studies documenting these effects in poverty reduction together with social welfare improvements especially within developing countries remain scarce (Masud-All-Kamal & Saha, 2014). Empirical research presented here establishes the link between public service efficiency and digital literacy to e-governance effectiveness by using mediation-moderation analysis. Previous research determined digital literacy's importance but failed to analyze it in depth as a governing efficiency modifier in practice. Through this, research scientists learned that digital literacy functions as a crucial factor, which intensifies the positive outcomes that result from e-governance programs for social welfare. The success of e-governance programs requires government investment in digital education with adequate infrastructure according to (Gupta et al., 2020).

Research exploring the direct effects of e-governance and administrative efficiency on poverty reduction and social welfare advancement remains scarce according to (Dutta, 2024). Most previous research studies use case studies combined with theoretical models instead of conducting empirical proof (Ebneyamini & Sadeghi Moghadam, 2018). This study resolves this research gap through a statistical method that examines how e-governance connects to poverty reduction alongside better social welfare. The research employs mediation through public service efficiency and moderation by digital literacy to deliver a thorough analysis of how e-governance shapes socio-economic results. Digital

accessibility stands as an essential condition, which makes effective governance possible while policymakers need to address digital infrastructure disparities to reach every social segment through e-governance efforts. Inclusive digital policies become critical because they determine the maximal impact governance technologies can have on socio-economic development. Empirical data in this study confirms that e-governance practices help decrease poverty levels while delivering improved social welfare standards. The study confirms the research hypotheses by showing that public service efficiency serves as a mediator between e-governance and social welfare outcomes which digital literacy controls. The study contributes beneficial policy recommendations through research gap analysis while expanding current knowledge of e-governance systems development. Research on digital governance's long-term impact on socio-economic development needs to use extended time series data because it will help understand its role in achieving sustainable development goals.

Theoretical and Practical Implications

This study provides several theoretical contributions. It extends the existing literature on e-governance by empirically validating its impact on poverty reduction and social welfare improvements. By incorporating public service efficiency as a mediator and digital literacy as a moderator, this research offers a nuanced understanding of the mechanisms through which e-governance influences socio-economic development. Furthermore, this study aligns with the Unified Theory of Acceptance and Use of Technology (UTAUT) framework, which explains how technological adoption and accessibility shape governance effectiveness. From a practical standpoint, these findings underscore the need for governments and policymakers to invest in digital infrastructure and literacy programs. Ensuring widespread digital access and education will enhance the success of e-governance initiatives, leading to improved social welfare outcomes. Additionally, public

sector institutions must focus on optimizing service delivery mechanisms through automation and AI-driven decision-making to maximize the impact of e-governance on poverty alleviation.

Limitations and Future Research

This study generates important findings however; multiple restrictions exist within its assessment. The research design as cross-sectional restricts the possibility to prove causal relationships between the variables. The long-term effects of e-governance on poverty reduction and social welfare need evaluation through extended time-based research. The research relies on data from a particular developing nation that reduces its ability to provide conclusions applicable to other worldwide regions. A better assessment of e-governance effectiveness requires research that includes national comparisons between both developing and developed countries. This analysis includes factors like public service efficiency and digital literacy but did not investigate three additional potential moderation variables, which include political stability together with regulatory frameworks and citizen engagement. Further research needs to integrate these variables because

they will generate a complete understanding of e-governance success.

Conclusion

The research findings serve as strong evidence, which confirms how e-governance technologies reduce poverty and create better social welfare outcomes. The research results uphold both proposed hypotheses and prove that public service efficiency acts as a mediator and digital literacy functions as a moderator between e-governance measures and social welfare results. The research contributes beneficial policy recommendations through its examination of unexplored areas in the field and expansion of established academic literature about e-governance frameworks. Policymakers need to establish digital inclusion approaches, which provide digital services to vulnerable populations in future policy requirements. Maximizing the advantages of e-governance initiatives demands substantial investments both in digital infrastructure and in developing citizens' digital literacy. Studies regarding e-governance's long-term socio-economic effects across different regions require future researchers to conduct both longitudinal research and comparative evaluations

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Author Contributions

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