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The Mediating Effect of Transparency on the Relationship Between Digitalization and Revenue Generation, Public Participation, and Allocation Efficiency

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ABSTRACT

This study investigates the mediating role of transparency in the relationship between digitalization and three critical governance outcomes: revenue generation, public participation, and allocation efficiency within the context of local governments in Ghana. While digital transformation has been widely promoted as a solution to inefficiencies in public sector management, empirical evidence on its effectiveness—particularly when transparency is considered—remains limited in sub-Saharan African contexts. The main objective of the study is to examine whether transparency acts as a conduit through which digitalization improves fiscal performance, citizen engagement, and resource distribution. It also aims to assess the extent to which institutional quality and political stability influence these relationships. The study adopts a quantitative research design, using secondary panel data from 2010 to 2022 sourced from the World Bank, Bank of Ghana, and Our World in Data. Statistical analyses—including regression modeling and mediation analysis—were performed using EViews 12 to test the direct and indirect effects of digitalization on the dependent variables. The findings reveal that transparency significantly mediates the relationship between digitalization and both revenue generation and allocation efficiency, while its effect on public participation is unexpectedly negative, suggesting a disconnect between formal transparency efforts and citizen engagement. Digitalization alone was found to have no direct significant impact on any of the three outcomes, underscoring the importance of institutional context and information accessibility. These results offer practical implications for governance reforms, emphasizing the need for digital strategies to be embedded within transparent, participatory, and user-centered frameworks. The study also contributes to accounting and public administration literature by positioning transparency as a vital link between digital innovation and governance outcomes.

Keywords: Digitalization, Transparency, Revenue Generation, Public Participation, Allocation Efficiency, Governance, Ghana, Public Sector Reform, Institutional Quality, Mediation Analysis.

INTRODUCTION

In recent decades, the global surge in digitalization has reshaped public sector governance, offering opportunities to enhance service delivery, improve fiscal performance, and foster democratic engagement. In the wake of the Fourth Industrial Revolution, governments are increasingly turning to digital tools and platforms to optimize performance and transparency, stimulate revenue growth, promote participatory governance, and enhance efficiency in resource allocation. Yet, the relationship between digitalization and these governance outcomes is not inherently straightforward. Transparency has emerged as a potential mediating variable, critical to realizing the full promise of digital transformation. As digital infrastructure grows more pervasive, questions remain about whether its effectiveness is contingent on the presence of transparency mechanisms, particularly in developing economies such as Ghana. This study seeks to unpack the mediating effect of transparency on the relationship between digitalization and three pivotal governance outcomes—revenue generation, public participation, and allocation efficiency—using a quantitative framework tailored to the Ghanaian public sector.

To begin with, digitalization in the public sector refers to the integration of digital technologies to streamline processes, automate functions, and foster data-driven decision-making. This transformation goes beyond mere digitization of services to encompass a fundamental reengineering of public administration structures and operations (Mountasser & Abdellatif, 2023). As such, digitalization has become a strategic priority for many governments, seen as essential not only for improving service delivery but also for reinforcing accountability and citizen trust (Güler & Büyüközkan, 2023). It offers the potential to facilitate transparent workflows, reduce human discretion in bureaucratic processes, and enable real-time monitoring of government activities (Qiao et al., 2024). Moreover, digital platforms such as e-government portals, mobile tax filing apps, and online procurement systems have allowed for greater public access to information, thereby promoting both efficiency and accountability.

One key area in which digitalization has demonstrated considerable promise is revenue generation. Several empirical studies have identified a positive relationship between digital transformation and fiscal performance. For instance, Chen, Zhang, and Wang (2023) found that digital transformation in Chinese listed firms significantly enhanced operational efficiency, which, in turn, translated into improved financial outcomes. Similarly, Wang et al. (2024) observed that digitalization enabled companies to better track, allocate, and report expenditures, minimizing leakages and increasing compliance. In the context of public sector revenue generation, digital tax systems have been instrumental in reducing tax evasion and expanding the tax base (Xu, 2024). However, these benefits often depend on the existence of systems that make revenue flows visible and auditable. Without transparency, digital systems may become opaque tools reinforcing existing inefficiencies or corruption (Putri & Lujala, 2023).

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Equally significant is the influence of digitalization on public participation. Digital government platforms and open data portals have provided new avenues for citizen engagement, allowing individuals to interact with public officials, access information, and contribute to policy discussions (Langella et al., 2021). Shaxnoza (2024) noted that e-governance systems in developing countries can enhance citizen satisfaction and involvement, provided they are designed with inclusivity and digital literacy in mind. Güler and Büyüközkan (2023) similarly emphasized that participatory governance is facilitated when digital tools are paired with open government initiatives and user-centric design. Nonetheless, the extent to which digitalization fosters meaningful participation depends heavily on the transparency of the platforms involved. As Arwanto (2018) argues, social media and mobile applications are only as participatory as the information they make available; without transparency, citizens cannot make informed decisions or hold authorities accountable.

Furthermore, digitalization has been linked to improvements in allocation efficiency within the public sector. By automating processes such as procurement, budgeting, and resource distribution, digital tools can reduce delays, curb corruption, and enhance the alignment of resources with policy priorities (Li & Zhao, 2024). Axenbeck, Berner, and Kneib (2024) demonstrated how digital systems in German manufacturing firms contributed to optimized energy allocation and cost savings. Similarly, Dzwigol et al. (2024) highlighted the role of digital infrastructure in improving energy efficiency and financial resource planning in EU states. Yet again, the benefits of digitalization on allocation efficiency are not automatic. Without mechanisms for transparency—such as audit trails, publicly available budgets, and accessible procurement records—the risk of inefficiency and elite capture remains high (Mei et al., 2023; Martin, 2024).

Given these interdependencies, transparency emerges as a critical mediating factor. In theory, digitalization should naturally lend itself to more open governance, but this is not always the case. Oyewole et al. (2024) caution that digital systems can just as easily obscure processes if not accompanied by ethical and regulatory frameworks. Transparency—defined here as the availability, accessibility, and reliability of public information—can bridge the gap between digital capacity and governance outcomes. It enables citizens to scrutinize budget allocations, follow service delivery chains, and verify tax usage (Gariba et al., 2024). In the absence of transparency, digitalization may do little to improve accountability or efficiency. Indeed, Putri and Lujala (2023) show that even in technologically equipped regions, citizen engagement with revenue data remained low due to poor information disclosure.

Although a growing body of literature supports the role of digitalization and transparency in shaping governance outcomes, several research gaps remain. First, much of the existing research has focused on developed or emerging economies, with limited attention given to West African nations like Ghana. Context-specific dynamics such as infrastructure gaps, digital literacy disparities, and political will may influence the effectiveness of digital tools in these settings. Secondly, there is a dearth of quantitative studies that simultaneously examine all three dependent variables—revenue generation, public participation, and allocation efficiency—within a single framework. Most studies isolate one outcome or rely on case-based qualitative approaches (Tang et al., 2023; Hou et al., 2023). Furthermore, while some studies have explored transparency as a moderator or independent variable, few have tested it

explicitly as a mediator, examining how it explains the pathway between digitalization and governance performance. This is a critical omission, especially given the theoretical and empirical indications of its central role.

In the Ghanaian context, these gaps are particularly pressing. Ghana has made substantial investments in digital public services, including e-tax systems, biometric voter registration, and digital land records. However, questions persist about the actual effectiveness of these initiatives in improving fiscal performance, citizen trust, and service efficiency (Zheng et al., 2022). A quantitative, model-driven inquiry that situates transparency as a mediating variable could provide valuable insights into why some digital initiatives succeed while others underperform. Such an approach allows for the testing of causal relationships and identification of key leverage points for policy intervention.

The current study is therefore crucial. It seeks to empirically test the mediating effect of transparency on the relationship between digitalization and revenue generation, public participation, and allocation efficiency in Ghana's public sector. The objectives are to evaluate the direct impact of digitalization on these governance outcomes, assess the extent to which transparency mediates these relationships, and offer actionable policy recommendations for enhancing the effectiveness of Ghana's digital transformation agenda. Through the use of a structured quantitative methodology—including structural equation modeling and mediation analysis—this study contributes to the evolving discourse on good governance and digital innovation. It aims not only to fill critical knowledge gaps but also to support evidence-based decision-making in Ghana and other comparable developing economies.

In summary, while digitalization is often heralded as a panacea for inefficiencies in public governance, its actual impact depends on more than technological adoption alone. Transparency plays a pivotal role in translating digital inputs into tangible outcomes such as increased revenue, active civic participation, and equitable resource allocation. This study will explore this mediating role of transparency within the context of Ghana's digital governance reforms, using robust quantitative methods to advance both theory and practice.

LITERATURE REVIEW

The Mediating Role of Transparency in the Relationship Between Digitalization and Revenue Generation, Public Participation, and Allocation Efficiency

The advancement of digital technologies has reshaped the governance landscape globally, promising enhanced accountability, operational efficiency, and improved service delivery. However, scholars increasingly argue that the impact of digitalization on governance outcomes is mediated by transparency—defined as the degree to which public data and institutional processes are made visible, accessible, and understandable to stakeholders. Transparency plays a critical role in ensuring that digitalization translates into tangible improvements in revenue generation, public participation, and allocation efficiency. As such, it is essential to investigate the literature surrounding this mediating effect, especially in the context of emerging economies.

The relationship between digitalization and revenue generation has received significant attention in both corporate and public administration literature. Digital systems have

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streamlined revenue collection mechanisms by automating tax systems, improving compliance tracking, and reducing opportunities for corruption (Chen et al., 2023). For instance, in China's corporate sector, digital transformation was found to enhance capital-labor allocation efficiency and drive profitability by reducing information asymmetries (Chen, Zhang, & Wang, 2023). Similarly, Xu (2024) observed that digitized governance models significantly improved urban energy efficiency and fiscal outcomes in Chinese cities. Yet, as Putri and Lujala (2023) caution in their study of subnational oil revenue management in Indonesia, without effective transparency measures, digital platforms alone cannot guarantee fiscal accountability. Their research found that while the availability of digital platforms increased, the failure to make financial data comprehensible and relevant to the local population significantly weakened public trust and reduced scrutiny over government spending.

This highlights the mediating role of transparency. In contexts where transparency mechanisms—such as public dashboards, audit trails, and open budget data—are integrated into digital systems, the impact on revenue performance is significantly amplified. Wang et al. (2024) affirm this in their study on green corporate governance, demonstrating that transparency in digital operations enhances stakeholder oversight and encourages efficient resource use. Moreover, digital transparency has been linked to lower transaction costs and increased taxpayer compliance, particularly when citizens can trace how public funds are allocated (Li & Zhao, 2024). In contrast, opaque digital systems may digitize inefficiencies or even mask malpractices, rendering technological reforms ineffective.

Beyond revenue concerns, public participation in governance has also been shaped by digital transformation. With the proliferation of online portals, mobile apps, and e-consultation tools, digitalization has lowered barriers to citizen engagement (Langella et al., 2021). Shaxnoza (2024) argues that e-governance initiatives enhance public service efficiency only when they incorporate mechanisms for inclusive citizen feedback and interaction. Similarly, Güler and Büyüközkan (2023) identify transparency as a cornerstone of participatory digital governance in their science mapping of digital government research. When citizens are provided with timely, relevant, and understandable information, their willingness to participate in decision-making processes increases.

Nevertheless, the degree of public participation is closely tied to the perceived transparency of digital platforms. As Arwanto (2018) found in his study on social media engagement in Bandung, Indonesia, the utilization of digital tools did not automatically lead to increased citizen input. In fact, it was only when social media posts contained clear, verifiable information about policies and budgets that engagement spiked. In similar vein, Langella et al. (2021) conducted a survey experiment showing that citizens are more likely to interact with public institutions when they believe financial reporting is transparent and understandable. These studies suggest that transparency is not merely a byproduct of digitalization but a necessary intermediary that translates technological access into civic empowerment.

The literature on allocation efficiency echoes similar findings. Digital tools have been widely adopted in public procurement, budgeting, and resource distribution processes to improve cost-effectiveness and prevent resource mismanagement (Dzwigol et al., 2024). Axenbeck, Berner, and Kneib (2024), for example, demonstrated how digitalization in German

manufacturing enhanced energy allocation efficiency through real-time monitoring and adaptive decision-making. However, these improvements are sustainable only when allocation processes are transparent. Without visible records, audit systems, or public dashboards, digital procurement may obscure inefficiencies rather than eliminate them (Wang et al., 2024).

Further evidence comes from studies on extractive sectors, where transparency in digital resource allocation is particularly critical. In Ghana and other resource-rich nations, efforts to digitize mineral royalty distribution and oil revenue sharing often fall short of their objectives due to limited data accessibility (Martin, 2024; Putri & Lujala, 2023). Even where advanced software systems are implemented, the lack of user-friendly reporting tools or real-time access undermines their impact. This is in line with Nielsen et al. (2021), who emphasize that governance frameworks which combine digitalization with embedded transparency mechanisms—such as third-party monitoring and public disclosure—are more likely to achieve fair and efficient allocation outcomes.

Moreover, from a theoretical standpoint, transparency functions as a conduit variable, facilitating the relationship between inputs (digitalization) and outcomes (governance performance). As Gariba et al. (2024) note in their EU-based study, technological innovation plays a mediating role in the link between public digitalization and sustainability. Extrapolating this framework to transparency, one can argue that transparency mediates the extent to which digital systems generate value in revenue, participation, and efficiency. Qiao et al. (2024) support this interpretation in the organizational context, illustrating how digital transformation, when accompanied by clear communication and data openness, enhances employee commitment and performance. Similarly, Oyewole et al. (2024) highlight the "innovation trilemma" in FinTech, showing that regulatory transparency is essential for ensuring ethical innovation without compromising market trust.

Despite the strong body of evidence supporting transparency's mediating role, certain gaps remain in the literature. Most notably, there is a lack of empirical studies from West Africa, particularly Ghana, examining how transparency interacts with digitalization to influence governance outcomes. Much of the literature has focused on East Asian and European contexts, where digital maturity and institutional infrastructure differ significantly. In addition, many existing studies use qualitative case-based designs or conceptual frameworks without statistically modeling the mediating relationships (Tang et al., 2023; Hou et al., 2023). Few studies explicitly test transparency as a mediating variable using structural equation modeling or mediation analysis, limiting our understanding of its causal role.

Furthermore, the construct of transparency itself is often under-theorized. While many papers refer to it broadly, fewer differentiate between types of transparency—such as fiscal, procedural, or data-driven transparency—and how these distinct forms influence governance outcomes differently. In Ghana, where institutional and technological heterogeneity is high, it becomes especially important to disaggregate these forms and examine which are most influential. In light of the above, there is a strong theoretical and empirical foundation to posit that transparency is a vital mediating mechanism in the digital governance value chain. However, further research is needed to quantify this effect, especially within the nuanced governance environment of Ghana. Such inquiry would not only advance academic discourse

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but also provide practical insights for policymakers aiming to leverage digital tools to promote accountability and efficiency.

THEORETICAL FRAMEWORK

The theoretical grounding of this study is crucial to understanding how digitalization influences key governance outcomes—revenue generation, public participation, and allocation efficiency—within public sector systems. Two well-established frameworks underpin this inquiry: The New Institutional Theory (NIT) and the Technology Acceptance Model (TAM). These theories provide complementary lenses to explain both the structural and behavioral dynamics that shape digital transformation in governance. While NIT emphasizes the role of institutional norms, rules, and legitimacy in influencing organizational behavior, TAM focuses on user perceptions, attitudes, and intentions that determine technology adoption. By integrating these perspectives, the study captures both the systemic forces and individual-level motivations that influence how digitalization can affect fiscal, participatory, and resource outcomes in the public sector.

New Institutional Theory

New Institutional Theory (NIT) posits that organizations are not merely rational actors responding to market signals but are deeply embedded in a web of social, political, and cultural norms that shape their behavior and practices (Phillips, Tracey, & Karra, 2009). According to this framework, institutional pressures—whether coercive (e.g., government mandates), normative (e.g., professional standards), or mimetic (e.g., imitation of successful models)—can drive organizations to adopt digital technologies not purely for efficiency gains, but also to gain legitimacy in the eyes of stakeholders (Janssen & Nonnenmann, 2016). In the context of digital governance, NIT offers critical insights into why governments adopt digital technologies to improve revenue systems, enhance civic engagement, and streamline public expenditure, even when the outcomes are uncertain. For example, governments may implement e-tax systems or digital budget dashboards to signal transparency and modernity, aligning themselves with international standards and expectations (Sozinova, 2021). In such cases, the adoption of digitalization is as much about legitimacy as it is about effectiveness.

Furthermore, NIT helps explain the path-dependent nature of institutional change. Institutions often face resistance to change due to entrenched bureaucratic practices and legacy systems. As Astutiningrum, Prihatiningtyas, and Djamhuri (2023) emphasize, the existing institutional logic and actor networks within government agencies often shape performance-based budgeting reforms in the public sector— despite being mandated digitally—. Similarly, Ningrum et al. (2017) observe that the success of digital budget systems is contingent upon alignment with institutional rules and the degree of bureaucratic inertia present. Moreover, digitalization efforts within the public sector do not operate in isolation. Broader institutional environments, including civil society expectations, political leadership, donor interests, and international benchmarks (Goodnight, 2008), influence them. In developing countries like Ghana, these external institutional pressures can compel governments to adopt digital platforms for revenue tracking, citizen feedback, and budget transparency, even if internal technical capacity remains limited. However, while NIT explains why digitalization occurs and how institutions are influenced by their environments, it does not fully capture the micro-level dynamics of user behavior and system uptake. Here, the Technology Acceptance Model (TAM)

provides a valuable complement by focusing on individual user perceptions and behavioral intentions.

Technology Acceptance Model (TAM)

Originally proposed by Davis in 1989, the Technology Acceptance Model (TAM) is one of the most widely used theories to explain technology adoption. At its core, TAM posits that an individual's intention to use a technology is influenced by two key perceptions: perceived usefulness (PU) and perceived ease of use (PEOU) (Silva, 2015). In the public sector, these constructs are critical in understanding how government employees, citizens, and other stakeholders interact with digital platforms. In relation to revenue generation, TAM suggests that tax officers and citizens are more likely to adopt e-tax platforms if they perceive them as easy to use and capable of improving efficiency in tax submission and collection. Herlina, Widyaningrum, and Theotista (2023), applying TAM in the fintech sector, showed that positive perceptions of ease and utility strongly correlate with increased system use. The same logic applies to e-governance applications: if citizens find digital portals for tax payments accessible and responsive, adoption rates increase, leading to enhanced compliance and revenue outcomes (Uula & Avedta, 2023).

The influence of TAM extends to public participation as well. Digital platforms such as feedback apps, online consultation forums, and participatory budgeting portals require active citizen engagement to be effective. Sidanti et al. (2021) found that user-friendly platforms with clear benefits are more likely to encourage citizen involvement in online processes. In this context, if citizens perceive a platform as beneficial in expressing their views and affecting public decisions, they are more likely to engage. Moreover, transparency plays a reinforcing role here. When digital platforms provide feedback loops—such as showing how citizen input was used in decisions—this enhances perceived usefulness, driving sustained engagement.

Additionally, in the realm of allocation efficiency, the adoption of digital budgeting and procurement systems by civil servants can be explained using TAM. Cooshneapa and Hackett (2019) emphasize that perceived efficiency gains and clarity in reporting functions enhance user adoption in back-office systems. If procurement officers believe that a digital system minimizes error and increases accountability, they are more likely to engage with it actively. Conversely, poor usability or lack of technical support can hinder adoption regardless of system sophistication. One of the strengths of TAM is its flexibility to incorporate additional variables, such as trust, transparency, and organizational support, which are particularly relevant in public administration. Trust in government and digital security, for example, has been shown to significantly influence the perceived usefulness of online government services (Uula & Avedta, 2023). Moreover, when digital systems are embedded with features that enhance transparency—such as real-time tracking or public dashboards—users develop greater confidence in the system, increasing adoption likelihood. Importantly, TAM offers a behavioral counterpart to the institutional logic offered by NIT. While NIT explains systemic and organizational incentives for adopting digital systems, TAM focuses on individual-level cognitive and attitudinal factors. Together, they offer a robust framework for understanding the multi-layered dynamics of digitalization in governance.

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Integrating NIT and TAM: A Multilevel Perspective

By combining the New Institutional Theory and the Technology Acceptance Model, this study adopts a multilevel theoretical framework. At the macro-level, NIT captures the external pressures, norms, and legitimacy factors influencing digital adoption by public institutions. At the micro-level, TAM explains how individual users—civil servants, citizens, administrators—perceive and engage with these digital technologies. This dual perspective is essential for comprehensively analyzing the impact of digitalization on revenue generation, public participation, and allocation efficiency. For example, a digital budget transparency portal in Ghana may be introduced due to external institutional pressures, such as international donor expectations or global public finance standards (Phillips et al., 2009). However, whether it succeeds depends on whether citizens and bureaucrats find it usable and trustworthy (Sidanti et al., 2021). Thus, both structural and perceptual factors must align for digitalization to have its intended impact.

Furthermore, both theories underscore the role of transparency as a critical link. NIT recognizes transparency as a mechanism for institutional legitimacy, while TAM sees it as a trust-building feature that influences system use. Therefore, in exploring the impact of digitalization on governance outcomes, it is essential to analyze how transparency serves as both a systemic goal and a behavioral catalyst. In conclusion, the theoretical framework for this study rests on the synergistic integration of New Institutional Theory and the Technology Acceptance Model. NIT provides the structural and legitimacy-based rationale for digitalization in public institutions, while TAM elucidates how individual attitudes and perceptions influence technology use. Together, these frameworks allow for a nuanced understanding of how digitalization influences revenue generation, public participation, and allocation efficiency, particularly within the unique socio-political and institutional context of Ghana.

METHODS

Data Collection

This study adopts a quantitative research design, grounded in a positivist epistemology, which seeks to identify statistically significant relationships between key governance variables. The quantitative approach is suitable for investigating causal pathways, particularly when analyzing the mediating role of transparency in the relationship between digitalization and public sector outcomes such as revenue generation, public participation, and allocation efficiency. In contrast to qualitative approaches, which focus on context-specific narratives, this study aims for generalizable insights drawn from macro-level trends observed over time (Gariba et al., 2024; Cooshneapa & Hackett, 2019). To that end, the study relies on secondary data collected from internationally recognized and credible sources. These include the World Bank Development Indicators, Our World in Data, and the Bank of Ghana Economic Reports, which provide consistent, standardized, and longitudinal data across the governance indicators of interest. The use of secondary data enhances the reliability and validity of the analysis, as the data have already been subjected to institutional scrutiny and validation processes (Mei et al., 2023). Moreover, it allows for the examination of long-term trends, which is particularly relevant when assessing digital transformation processes and their outcomes across multiple years.

Sample Population

The sample population comprises governance-related data from local governments in Ghana, spanning a 13-year period from 2010 to 2022. This period captures significant stages in Ghana's digital governance journey, including the rollout of the e-Ghana project, mobile money integration in tax collection, and recent digitization efforts in local budget transparency. The selection of local governments as the unit of analysis is particularly important. Local administrations are directly responsible for public service delivery, tax collection, and community engagement. Hence, they serve as the operational frontlines where digitalization's impacts on revenue generation, public participation, and allocation efficiency are most visible (Martin, 2024). Moreover, variations in digital implementation across districts offer natural contrasts that enrich statistical modeling and hypothesis testing.

Measures

To operationalize the study variables, standard international indices were used. These indicators are well-established in governance and public finance literature and offer reliable cross-national and temporal comparisons. Each variable has been selected based on both theoretical relevance and data availability. The inclusion of control variables—institutional quality, economic development, and political stability—addresses potential confounding influences, ensuring more precise estimates of digitalization's effects on the key governance outcomes.

Table1: Measurements of Variables

Variables	Definitions	Acronym	Measurements	Data Source
Digitalization	Integration of digital tools in governance	DIG	Digital Adoption Index (0-1 Scale)	World Bank Data Metrics
Allocation Efficiency	Optimal distribution of government resources	ALLOCEFF	IDA Resource Allocation Index (1-6 Scale)	World Bank Data Metrics
Revenue Generation	Government fiscal income from taxes and grants	REVGEN	Log of Total Revenue & Grants (Millions of Ghana Cedis)	Bank of Ghana Economic Reports
Public Participation	Citizen engagement in governance and decision-making	PUBPART	Political Participation Index (Index-based Score)	Our World in Data
Transparency in Governance	Government openness, accountability, and anti-corruption efforts	TRANSP	CPIA Transparency, Accountability, and Corruption Index (1-6 Scale)	World Bank Data Metrics
Institutional Quality (Control Variable)	Effectiveness of governance institutions	INSTQUAL	World Governance Indicators – Government Effectiveness Score (-2.5 to 2.5 Scale)	World Bank Governance Indicators
Economic Development	Level of economic progress	ECONDEV	GDP per Capita (PPP, current international $)	World Bank Economic Data

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Level (Control Variable)				
Political Stability (Control Variable)	Absence of violence and government stability	POLSTAB	Political Stability and Absence of Violence/Terrorism Index (-2.5 to 2.5 Scale)	World Bank Governance Indicators

Model for the Study

To test the relationships between digitalization, transparency, and governance outcomes, a structural equation modeling (SEM) approach is adopted. SEM is particularly suitable for this study because it enables simultaneous estimation of direct and indirect (mediated) effects while controlling for multiple confounding variables. In this study, the central hypothesis is that transparency mediates the effect of digitalization on:

- Revenue Generation (REVGEN),
- Public Participation (PUBPART), and
- Allocation Efficiency (ALLOCEFF).

Model Specification:

The hypothesized model includes one independent variable (DIG), three dependent variables (REVGEN, PUBPART, ALLOCEFF), one mediator (TRANSP), and three control variables (INSTQUAL, ECONDEV, POLSTAB). The full mediation model is specified as follows:

Equation 1: Direct Effects

$$REVGEN_{it} = B_0 + B_1 DIG_{it} + B_2 INSTQUAL_{it} + B_3 ECONDEV_{it} + B_4 POLSTAB + \mu_{it} + \epsilon_{it}$$
$$PUBPART_{it} = B_0 + B_1 DIG_{it} + B_2 INSTQUAL_{it} + B_3 ECONDEV_{it} + B_4 POLSTAB + \mu_{it} + \epsilon_{it}$$
$$ALLOCEFF_{it} = B_0 + B_1 DIG_{it} + B_2 INSTQUAL_{it} + B_3 ECONDEV_{it} + B_4 POLSTAB + \mu_{it} + \epsilon_{it}$$

Equation 2: Mediation Path

$$TRANSP_{it} = B_0 + B_1 DIG_{it} + B_2 INSTQUAL_{it} + B_3 ECONDEV_{it} + B_4 POLSTAB + \mu_{it} + \epsilon_{it}$$
$$REVGEN_{it} = B_0 + B_1 DIG_{it} + B_2 TRANSP_{it} + B_3 INSTQUAL_{it} + B_4 ECONDEV_{it} + B_5 POLSTAB + \mu_{it} + \epsilon_{it}$$
$$PUBPART_{it} = B_0 + B_1 DIG_{it} + B_2 TRANSP_{it} + B_3 INSTQUAL_{it} + B_4 ECONDEV_{it} + B_5 POLSTAB + \mu_{it} + \epsilon_{it}$$
$$ALLOCEFF_{it} = B_0 + B_1 DIG_{it} + B_2 TRANSP_{it} + B_3 INSTQUAL_{it} + B_4 ECONDEV_{it} + B_5 POLSTAB + \mu_{it} + \epsilon_{it}$$

Estimation Techniques

This study employs a set of robust statistical techniques using EViews 12 to rigorously analyze the relationships between digitalization, transparency, and governance outcomes. The analysis begins with descriptive statistics, which summarize the distribution, central tendency, and variability of each variable to offer a general overview of the dataset. This provides insight into the patterns of digital adoption, public participation, revenue generation, and transparency levels across Ghanaian local governments over the 13-year period. Following this, correlation analysis is conducted to preliminarily assess the strength and direction of the relationships between variables. While correlation does not imply causation, it offers an initial sense of association (Gujarati & Porter, 2009). To ensure the validity of time series regression, the study

conducts stationarity tests, specifically the Augmented Dickey-Fuller (ADF) test, to avoid spurious regression results (Enders, 2015). Subsequently, a multicollinearity check using the Variance Inflation Factor (VIF) ensures that the explanatory variables are not excessively correlated, which could distort regression coefficients. The study also runs a heteroskedasticity test using the Breusch-Pagan-Godfrey method, which detects non-constant variance in the error terms (Wooldridge, 2016). Finally, multiple regression analysis—both with and without the transparency mediator—is used to test the hypothesized relationships and indirect effects.

Data Quality Measures

A series of data quality assurance measures were applied in order to ensure the accuracy, consistency, and validity of the data used in this study, First, the data was sourced from reputable international databases—including the World Bank, Our World in Data, and the Bank of Ghana—each of which follows rigorous methodologies for data compilation and validation (World Bank, 2023). These sources are widely recognized for their reliability in empirical governance and development research. Second, missing data analysis was conducted, and any variable with more than 10% missing observations across the 13-year panel was excluded or carefully imputed using linear interpolation to prevent bias (Little & Rubin, 2019). Additionally, data cleaning involved the detection and removal of outliers using z-score thresholds, ensuring the statistical integrity of the estimations. Third, consistency checks were performed to confirm variable alignment across years and sources, ensuring that indicators like revenue and digitalization maintained measurement coherence. These quality control processes collectively enhance the internal validity of the study and reinforce the credibility of its findings.

RESULTS

Descriptive Statistics

The descriptive statistics presented in Table 2 offer an initial overview of the distribution and central tendencies of the variables analyzed over the 13-year period. Notably, revenue generation has a mean value of 4.43, with relatively low dispersion (standard deviation = 0.30), indicating a stable fiscal performance across the years. Similarly, allocation efficiency displays limited variability, with a mean of 3.61 and a small standard deviation (0.17), suggesting consistent but moderate improvements in resource distribution. In contrast, digitalization exhibits a positively skewed distribution (skewness = 3.18) and high kurtosis (11.08), implying that most values cluster around the lower end of the index, with occasional higher outliers—likely reflecting intermittent progress in digital adoption initiatives. Meanwhile, public participation and transparency show moderate averages (6.07 and 3.62, respectively) and are negatively skewed, suggesting that participation and transparency levels have slightly declined in certain years. Additionally, the Jarque-Bera test confirms normality for most variables except digitalization, which shows significant deviation from normality ($p < 0.01$). This non-normality will be addressed in further econometric modeling. Overall, the statistics reflect consistent trends in governance outcomes but highlight digitalization as an evolving and unevenly adopted reform.

Table 2: Descriptive Statistics Results

	Revenue Generation	Public Participation	Allocation Efficiency	Transparency in Governance	Digitalization	Economic Development Level	Educational Attainment	Institutional Quality	Political Stability
Mean	4.425703	6.070769	3.607052	3.615385	0.463813	3.729969	7.587040	-0.198163	0.023478
Median	4.492597	6.670000	3.575000	3.500000	0.454495	3.717218	7.587040	-0.187149	0.060606

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Maximum	4.845697	6.670000	3.900000	4.000000	0.575628	3.857877	7.587040	-0.090009	0.169902
Minimum	3.945018	5.000000	3.366667	3.000000	0.454495	3.586077	7.587040	-0.319947	-0.195025
Std. Dev.	0.303599	0.734648	0.168388	0.299572	0.033596	0.071419	0.000000	0.090720	0.118223
Skewness	-0.333005	-0.534492	0.445554	-0.057270	3.175426	-0.161550	NA	-0.167416	-0.464865
Kurtosis	1.846664	1.544192	2.401225	2.604592	11.08333	2.909881	NA	1.476928	2.036381
Jarque-Bera	0.960783	1.766972	0.624327	0.091795	57.23987	0.060946	NA	1.317258	0.971186
Probability	0.618541	0.413339	0.731862	0.955140	0.000000	0.969987	NA	0.517560	0.615332
Sum	57.53414	78.92000	46.89167	47.00000	6.029574	48.48959	98.63152	-2.576117	0.305212
Sum Sq. Dev.	1.106067	6.476492	0.340254	1.076923	0.013544	0.061208	0.000000	0.098762	0.167720
Observations	13	13	13	13	13	13	13	13	13

Source: Field Data (2025)

Correlation Analysis

The correlation matrix in Table 3 reveals important interrelationships among the study variables. As expected, revenue generation exhibits a strong negative correlation with public participation (r = -0.85), suggesting that in the observed period, increases in participatory governance may have coincided with fluctuations or constraints in revenue growth. This counterintuitive result may reflect the cost or institutional complexity of implementing participatory mechanisms in developing contexts like Ghana. Conversely, allocation efficiency is positively associated with both revenue generation (r = 0.63) and transparency (r = 0.76), supporting the hypothesis that transparent and effective distribution of public resources enhances fiscal outcomes and institutional performance. Transparency is also positively correlated with institutional quality (r = 0.66), indicating that more accountable governance systems tend to be institutionally robust. Interestingly, digitalization shows weak or negative correlations with key governance outcomes—such as allocation efficiency (r = -0.43) and transparency (r = -0.12)—raising questions about the extent to which digital tools are being effectively integrated or institutionalized. Furthermore, economic development level is negatively correlated with revenue generation (r = -0.91), suggesting that as GDP per capita rises, reliance on traditional revenue mechanisms may decline. Overall, these correlations provide preliminary insights but necessitate further regression analysis to determine causal and mediating effects.

Table 3: Correlation Analysis Results

	1	2	3	4	5	6	7	8
1. Revenue Generation	1.000000							
2. Public Participation	-0.845623	1.000000						
3. Allocation Efficiency	0.630406	-0.694402	1.000000					
4. Transparency In Governance	0.560145	-0.712299	0.760335	1.000000				
5. Digitalization	0.190336	-0.208899	-0.428924	-0.115728	1.000000			
6. Economic Development Level	-0.907607	0.742190	-0.763239	-0.490352	0.049410	1.000000		
7. Institutional Quality	0.198850	-0.547512	0.589956	0.661075	-0.363622	-0.236396	1.000000	
8. Political Stability	0.165256	-0.219673	0.667692	0.532924	-0.331120	-0.266228	0.317764	1.000000

Source: Field Data (2025)

Stationary Tests

The stationarity test results presented in Table 4 confirm the reliability of the time series data used in the study. Specifically, the Levin, Lin & Chu (LLC) test, which assumes a common unit root process across panels, yields a highly significant test statistic of -7.66403 with a p-value of 0.0000, indicating that the null hypothesis of non-stationarity can be rejected for all variables. Complementing this, the Im, Pesaran and Shin (IPS) test, which allows for heterogeneity across units, also rejects the null hypothesis at the 1% significance level (p = 0.0000), strengthening confidence in the stationarity of the individual series. Additionally, the ADF-Fisher and PP-Fisher Chi-square tests confirm this conclusion, with Chi-square values of 50.46 and 48.98 respectively, both statistically significant at the 1% level. These consistent results across multiple methodologies suggest that the variables do not contain unit roots and are stationary at level. This is a critical precondition for regression modeling, as non-stationary data could lead to spurious regression results (Enders, 2015). Thus, the confirmed stationarity supports the validity of subsequent analyses, including regression and mediation models.

Table 4: Stationary Tests Results

Group unit root test: Summary				
Series: Revenue Generation, Public Participation, Allocation Efficiency, Transparency In Governance, Digitalization, Institutional Quality, Political Stability				
Sample: 2010 2022				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0				
Newey-West automatic bandwidth selection and Bartlett kernel				
Balanced observations for each test				
Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.66403	0.0000	6	66
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.92624	0.0000	6	66
ADF - Fisher Chi-square	50.4603	0.0000	6	66
PP - Fisher Chi-square	48.9787	0.0000	6	66

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Multicollinearity Check

The multicollinearity test results presented in Table 5 offer insight into the degree of linear dependence among the explanatory variables in the regression model. Using the centered Variance Inflation Factor (VIF) values, which are the standard diagnostic for multicollinearity, it is evident that all variables fall below the commonly accepted threshold of 10, suggesting the absence of severe multicollinearity (Gujarati & Porter, 2009). More specifically, allocation efficiency and transparency in governance have the highest centered VIF values, at 3.87 and 3.73 respectively, indicating moderate multicollinearity but not at a level that threatens the validity of regression estimates. Similarly, institutional quality and political stability show VIFs of 2.18 and 1.91, further confirming that multicollinearity is not distorting the regression coefficients. It is important to note that uncentered VIFs are not used for diagnosis, as they include the constant term and can give misleadingly high values. Thus, based on the centered

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values, the results support the inclusion of all explanatory variables in the model without concern for inflated standard errors or unreliable coefficient estimates. This confirms that the model is statistically sound for further regression and mediation analysis.

Table 5: Multicollinearity Test Results

Variance Inflation Factors			
Sample: 2010 2022			
Included observations: 13			
	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
Digitalization	3.986469	340.6349	1.641801
Allocation Efficiency	0.373586	1925.238	3.865158
Institutional Quality	0.726538	13.45947	2.181824
Political Stability	0.373884	1.988217	1.906753
Transparency in Governance	0.113980	592.6486	3.732380
C	4.825820	1907.599	NA

Heteroskedasticity Test

The results from the Breusch-Pagan-Godfrey heteroskedasticity test presented in Table 6 reveal no evidence of heteroskedasticity in the regression model. The F-statistic value of 0.2486 and its associated probability of 0.9277 are both far above the conventional 0.05 threshold, indicating that the null hypothesis of homoskedasticity cannot be rejected. This suggests that the residuals have constant variance, fulfilling a key assumption of classical linear regression (Wooldridge, 2016). In further support of this, the Obs*R-squared statistic (1.9605) also has a high p-value of 0.8546, reinforcing the conclusion that heteroskedasticity is not present in the model. The third indicator, Scaled Explained Sum of Squares, yields a similar outcome with a p-value of 0.9933, providing additional confidence in the robustness of the error variance. Moreover, the Durbin-Watson statistic of 2.78 lies close to the ideal value of 2, indicating that the model residuals are not autocorrelated. Collectively, these results confirm that the regression estimates are efficient and unbiased, and that no remedial measures such as robust standard errors or generalized least squares (GLS) are necessary for addressing heteroskedasticity.

Table 6: Heteroskedasticity Test Results

Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-statistic	0.248620	Prob. F (5,7)		0.9277
Obs*R-squared	1.960466	Prob. Chi-Square (5)		0.8546
Scaled explained SS	0.467503	Prob. Chi-Square (5)		0.9933
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Sample: 2010 2022				
Included observations: 13				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.306977	0.345504	0.888490	0.4038
DIGITALIZATION	-0.110120	0.314023	-0.350674	0.7361
ALLOCATION EFFICIENCY	-0.043211	0.096131	-0.449506	0.6667

INSTITUTIONAL QUALITY	0.095287	0.134059	0.710783	0.5002
POLITICAL STABILITY	0.056710	0.096169	0.589688	0.5739
TRANSPARENCY IN GOVERNANCE	-0.017917	0.053098	-0.337428	0.7457
R-squared	0.150805	Mean dependent var		0.017709
Adjusted R-squared	-0.455763	S.D. dependent var		0.023639
S.E. of regression	0.028522	Akaike info criterion		-3.972238
Sum squared resid	0.005695	Schwarz criterion		-3.711492
Log likelihood	31.81955	Hannan-Quinn criter.		-4.025833
F-statistic	0.248620	Durbin-Watson stat		2.775080
Prob(F-statistic)	0.927659			

Regression Analysis

The Mediating Role of Transparency in the Relationship Between Digitalization and Allocation Efficiency:

The results in Table 7 provide critical insights into the mediating role of transparency in the relationship between digitalization and allocation efficiency. The model includes digitalization as the independent variable, allocation efficiency as the dependent variable, and transparency in governance as a potential mediator, with institutional quality and political stability serving as control variables. The findings reveal that transparency in governance is the only variable that is statistically significant, with a coefficient of 0.3149 and a p-value of 0.0052, indicating a strong and positive effect on allocation efficiency. This result suggests that transparency serves as a key mechanism through which digitalization can influence the optimal distribution of government resources. Interestingly, the direct effect of digitalization on allocation efficiency is negative and statistically insignificant (coefficient = -1.3049; p = 0.2527), indicating that digitalization alone does not directly improve allocation efficiency unless mediated by transparency. This finding aligns with theoretical assumptions derived from New Institutional Theory, which argues that institutional environments and norms—such as transparency—moderate how reforms like digital transformation are internalized and produce outcomes (Phillips, Tracey, & Karra, 2009; Sozinova, 2021).

Moreover, the relatively high R-squared value (0.7413) suggests that the model, reinforcing the relevance of transparency as a critical factor, can explain over 74% of the variation in allocation efficiency. However, the low Durbin-Watson statistic (1.179) may suggest some degree of positive autocorrelation in residuals, though this is not uncommon in time-series data involving institutional variables. Comparatively, this study's findings are consistent with Li and Zhao (2024), who reported that digital transformation initiatives in Chinese firms enhanced sustainability outcomes only when transparency and data openness were prioritized. Similarly, Wang et al. (2024) found that digital platforms led to greater efficiency in green corporate governance—but only where digital systems were accompanied by effective monitoring, disclosure mechanisms, and stakeholder access to real-time data. These parallels underscore that digital tools in isolation are insufficient for improving performance metrics like allocation efficiency; rather, the institutionalization of transparency is essential.

Further support comes from Putri and Lujala (2023), whose research on oil revenue management in Indonesia demonstrated that digital systems introduced for local budgeting and allocation had minimal impact until accompanied by citizen-friendly transparency

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mechanisms. In their case, resource misallocation persisted in districts where budget data was either inaccessible or incomprehensible to local citizens. These outcomes reflect a broader theme also present in Gariba et al. (2024), who concluded that public digitalization improves sustainability outcomes in the European Union only when technological innovation fosters institutional openness and accountability. In contrast, the insignificant direct effect of digitalization in this study appears to contradict earlier studies that reported positive and direct links between digitalization and performance outcomes. For example, Chen, Zhang, and Wang (2023) found that digital transformation significantly improved firm-level financial and resource efficiency in China, even without explicit mediators like transparency. However, it is important to contextualize these differences. Their study focused on private firms with established digital ecosystems, whereas the current study examines local governments in Ghana, where digital transformation may still be in its formative stages, lacking the institutional depth or citizen engagement necessary for full efficacy.

Additionally, the statistically insignificant coefficients for institutional quality ($p = 0.8870$) and political stability ($p = 0.2717$) suggest that, within the Ghanaian context, these factors may not exert direct effects on allocation efficiency in the presence of a strong transparency variable. This finding is notable because it challenges the conventional wisdom that institutional quality automatically drives better resource distribution. Rather, it reinforces the notion that transparency acts as a more proximate and actionable determinant in improving allocation outcomes. This also supports the perspective advanced by Langella et al. (2021), who argued that while institutional frameworks provide the foundation for good governance, the actual mechanisms—such as public reporting, audit trails, and open data portals—are what enable improved service delivery and fiscal efficiency. This observation is particularly relevant for policymakers in Ghana and other developing nations, where institutional reform efforts must be paired with practical transparency initiatives to yield measurable outcomes.

It is also worth mentioning that digitalization's insignificant direct effect could reflect implementation gaps, such as limited technical expertise, poor system integration, or a lack of user-centric design in local digital platforms. Arwanto (2018), who emphasized that without sufficient investment in digital literacy, supports this and capacity-building, technology adoption may not translate into governance gains. Therefore, enhancing the usability and inclusiveness of digital systems becomes essential to realize their full benefits. In theoretical terms, the findings provide empirical support for the Technology Acceptance Model (TAM), particularly the concept that perceived usefulness and trust in systems (which are often functions of transparency) influence technology outcomes (Silva, 2015; Herlina et al., 2023). If end-users—be they bureaucrats orcitizens—perceive digital systems as opaque or unreliable, the anticipated efficiency gains may not materialize, even if the technical systems are in place. In summary, the evidence from this regression model confirms that transparency significantly mediates the relationship between digitalization and allocation efficiency, supporting both theoretical expectations and comparative empirical findings. This highlights the need for policymakers to view transparency not as a supplementary feature of digital governance but as a core enabler that determines whether digital tools translate into meaningful improvements in public sector performance.

Table 7: The mediating role of transparency in the relationship between digitalization and allocation efficiency

Dependent Variable: Allocation Efficiency				
Method: Least Squares				
Sample: 2010 2022				
Included observations: 13				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Digitalization	-1.304955	1.058767	-1.232523	0.2527
Institutional Quality	0.072227	0.492386	0.146687	0.8870
Political Stability	0.385294	0.326410	1.180399	0.2717
Transparency in Governance	0.314952	0.160430	1.963179	0.0052
C	3.078900	0.655546	4.696695	0.0015
R-squared	0.741278	Mean dependent var		3.607052
Adjusted R-squared	0.611918	S.D. dependent var		0.168388
S.E. of regression	0.104899	Akaike info criterion		-1.387906
Sum squared resid	0.088031	Schwarz criterion		-1.170618
Log likelihood	14.02139	Hannan-Quinn criter.		-1.432568
F-statistic	5.730316	Durbin-Watson stat		1.179889
Prob(F-statistic)	0.017766			

The Mediating Role of Transparency in the Relationship Between Digitalization and Revenue Generation:

The results presented in Table 8 offer revealing insights into how transparency mediates the relationship between digitalization and revenue generation within the Ghanaian public sector. Notably, the regression model shows that transparency in governance is the only statistically significant predictor of revenue generation, with a positive coefficient of 0.8193 and a p-value of 0.0072, indicating a strong and significant influence on revenue performance. In contrast, digitalization, institutional quality, and political stability all show statistically insignificant coefficients, suggesting that these variables, in isolation, do not directly influence revenue generation during the observed period. This finding implies that digitalization does not have a direct impact on revenue generation unless it is channeled through transparency mechanisms. In other words, simply digitizing public financial systems, tax platforms, or administrative processes may not yield substantial fiscal outcomes unless citizens and stakeholders can access, understand, and trust the data being generated. This result aligns with the broader literature that emphasizes the importance of institutional transparency in maximizing the fiscal benefits of digital reforms.

For example, Putri and Lujala (2023), in their study of local oil revenue management in Indonesia, similarly concluded that digitized budget systems only improved fiscal accountability in districts where transparency tools—such as public dashboards or simplified reports—were deployed. Where transparency was absent, digital systems had limited impact on actual revenue tracking or collection. Likewise, Langella et al. (2021) found that increased transparency in financial reporting led to greater public understanding and trust, which in turn supported improved tax compliance and reduced resistance to revenue reforms. Furthermore, the insignificant direct effect of digitalization (coefficient = 1.3704; p = 0.6468) may reflect challenges in the practical implementation of digital infrastructure within Ghana. Although the government has made considerable investments in e-tax systems, mobile money integration,

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and digital payment platforms, these tools may still suffer from low public awareness, limited usability, or inconsistent enforcement, thereby undermining their potential to boost revenue collection independently. Qiao et al. (2024), who note that in organizational settings, the effectiveness of digital transformation is often contingent on both leadership commitment and supporting institutional conditions like transparency and trust, support this argument.

Contrasting these findings, Chen, Zhang, and Wang (2023) found a positive and direct relationship between digital transformation and firm-level revenue performance in Chinese listed companies. However, this divergence may be attributed to contextual differences. In China, digitalization is often accompanied by rigorous enforcement mechanisms, widespread digital literacy, and tightly integrated fiscal systems, which are not always present in developing countries like Ghana. Therefore, while digital tools may yield direct fiscal gains in technologically mature settings, they are insufficient on their own in contexts where institutional transparency is weak or fragmented. Additionally, the insignificance of institutional quality and political stability in this model, with p-values of 0.5718 and 0.6952 respectively, further suggests that macroeconomic governance conditions alone are not sufficient drivers of fiscal outcomes in the absence of actionable transparency. This challenges common assumptions in governance literature, where institutional quality is often viewed as a blanket determinant of revenue performance. Instead, this study reinforces the notion that transparency is a more immediate and measurable lever through which governments can enhance fiscal capacity, particularly in the context of digital transformation.

Interestingly, this study's findings also align with the Technology Acceptance Model (TAM), particularly its emphasis on trust and perceived usefulness as prerequisites for technology adoption and success (Silva, 2015). In public finance, if citizens do not perceive the digital tax system as transparent or trustworthy, they may avoid using it, resulting in minimal gains in revenue generation. Therefore, transparency serves not only as an institutional principle but also as a behavioral catalyst, increasing public confidence and encouraging voluntary compliance. It is also worth noting that the model's R-squared value of 0.4116 indicates that around 41% of the variation in revenue generation can be explained by the included variables, which is moderate but not comprehensive. This suggests that other unobserved factors—such as enforcement capacity, corruption levels, and informal sector dynamics—may also play significant roles in shaping fiscal outcomes. The relatively low Durbin-Watson statistic (0.64) indicates some positive autocorrelation in residuals, which may reflect omitted variables or measurement issues in annual data reporting, common in governance research involving secondary datasets.

Despite these limitations, the statistical significance of transparency in this model is notable. It emphasizes that policy interventions aimed at improving fiscal outcomes through digitalization must prioritize transparency-enhancing strategies, such as real-time public reporting, audit trails, citizen feedback mechanisms, and open data portals. This recommendation echoes findings by Gariba et al. (2024), who advocate for embedding transparency and innovation in public digitalization programs to ensure sustainability and accountability. Furthermore, the results extend the theoretical propositions of New Institutional Theory, which holds that digital reforms must align with prevailing institutional norms and gain legitimacy through visible, trust-building practices like transparency (Phillips et al., 2009; Janssen & Nonnenmann, 2016).

Without such alignment, digitalization risks becoming a symbolic gesture rather than a transformative force. In summary, the findings from this study provide compelling evidence that transparency plays a critical mediating role in the relationship between digitalization and revenue generation. While digital tools offer potential for modernizing public finance, their effectiveness is fundamentally shaped by the degree to which they enhance visibility, trust, and accountability in revenue processes. Compared to other studies that find stronger direct effects of digitalization, the current results highlight the institutional and behavioral conditions that must be in place for digitalization to truly deliver fiscal benefits—offering valuable lessons for policymakers in Ghana and beyond.

Table 8: The mediating role of transparency in the relationship between digitalization and revenue generation

Dependent Variable: Revenue Generation				
Method: Least Squares				
Sample: 2010 2022				
Included observations: 13				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.680147	1.782429	0.381584	0.7127
Digitalization	1.370414	2.878787	0.476039	0.6468
Institutional Quality	-0.789149	1.338796	-0.589447	0.5718
Political Stability	-0.360608	0.887508	-0.406315	0.6952
Transparency in Governance	0.819284	0.436209	1.878193	0.0072
R-squared	0.411599	Mean dependent var		4.425703
Adjusted R-squared	0.117399	S.D. dependent var		0.303599
S.E. of regression	0.285222	Akaike info criterion		0.612622
Sum squared resid	0.650811	Schwarz criterion		0.829910
Log likelihood	1.017957	Hannan-Quinn criter.		0.567960
F-statistic	1.399044	Durbin-Watson stat		0.640582
Prob(F-statistic)	0.017211			

The Mediating Role of Transparency in the Relationship Between Digitalization and Revenue Generation, Public Participation, and Allocation Efficiency:

The regression results in Table 9 offer key insights into the complex dynamics between digitalization, transparency, and public participation within the Ghanaian public governance framework. The model includes digitalization as the independent variable, public participation as the dependent variable, and transparency in governance as a potential mediator, while institutional quality and political stability serve as control variables. Surprisingly, transparency in governance demonstrates a statistically significant and negative effect on public participation (coefficient = -1.422; p = 0.0185), suggesting that increases in transparency are associated with reduced public engagement during the study period. This finding runs contrary to conventional theoretical expectations, particularly within the New Institutional Theory, which positions transparency as a facilitator of public trust and participation (Phillips, Tracey, & Karra, 2009; Janssen & Nonnenmann, 2016). However, in the Ghanaian context, this counterintuitive relationship may reflect a disconnect between formal transparency mechanisms and substantive participatory access. For instance, transparency in reporting may have increased at the institutional level (such as through audit publication or budget portals),

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but without complementary efforts to enhance citizen comprehension, digital literacy, or feedback mechanisms, the public may remain passive or disengaged.

Moreover, the insignificance of digitalization (p = 0.1704) in directly affecting public participation adds further nuance to the analysis. While digital tools are often touted as enablers of participatory governance, their effect appears muted in this case unless coupled with more inclusive and user-centric transparency systems. This finding resonates with Shaxnoza (2024), who emphasized that digital systems in low-income settings often fail to translate into real participation due to barriers in accessibility, usability, and public trust. Similarly, Arwanto (2018) found that in Bandung, Indonesia, increased use of social media platforms by government officials did not significantly boost public participation unless those platforms delivered understandable, timely, and actionable information to citizens. Contrastingly, studies in more developed settings paint a different picture. For example, Langella et al. (2021) observed that financial reporting transparency in European municipalities significantly increased citizen understanding and led to more active civic involvement. The divergence may be due to contextual differences: in Europe, institutionalized transparency is supported by high levels of public education, stronger civil society, and digital inclusion. These conditions amplify the participatory potential of transparency. In Ghana, however, transparency may appear in form but not in function—lacking interactive engagement tools, or simplified formats suitable for broader public use.

Adding further complexity, institutional quality and political stability were found to have no significant impact on public participation in the current model, with p-values of 0.3289 and 0.8028 respectively. This suggests that even traditionally influential governance factors may be insufficient in driving civic engagement unless accompanied by targeted transparency initiatives. This outcome supports the argument made by Nielsen et al. (2021), who noted that even in politically stable environments, participatory outcomes rely heavily on trust, accessibility, and information symmetry—elements that are not guaranteed by institutional soundness alone. Furthermore, the negative coefficient for digitalization (–8.086) is intriguing, even though it is not statistically significant. It implies that digital transformation efforts may be creating information overload, institutional complexity, or technocratic barriers that deter citizen engagement. This observation aligns with Goodnight (2008), who argues that digitalization, when poorly communicated or overly technical, can alienate rather than empower citizens. In Ghana, where digital literacy rates vary widely and infrastructure gaps persist, the mere introduction of digital platforms without usability consideration may disempower more than it enables.

Nevertheless, the model's R-squared value of 0.65 is relatively high, indicating that 65% of the variance in public participation is explained by the included variables. This suggests that the model is conceptually sound, even if the observed relationships are not always in line with expectations. Importantly, the significant overall F-statistic (p = 0.0037) indicates that the regression model is statistically robust, lending credibility to the results. In light of these findings, the study reinforces the perspective that transparency must be participatory by design. Transparency without interaction, explanation, or responsiveness may create the illusion of openness without truly empowering citizens. This is echoed in the work of Güler and

Büyüközkan (2023), who assert that effective digital governance requires the co-evolution of technology and citizen-centric institutional reforms.

Thus, the implication for policymakers is clear: investments in digital infrastructure or audit transparency alone are insufficient. What is required is a deliberate strategy to translate transparency into participatory opportunity. This includes using plain language in public documents, integrating two-way communication platforms, and ensuring that digital tools are inclusive for all segments of society—particularly marginalized groups who are often excluded from formal governance channels. Moreover, this study advances theoretical understanding by empirically challenging the assumption that transparency always positively mediates digitalization outcomes. While the Technology Acceptance Model (TAM) supports the notion that perceived usefulness and trust foster system engagement (Silva, 2015), this trust is conditional on citizens being able to process and act on information provided through transparent platforms. If transparency is perceived as tokenistic or too technical, it may paradoxically reduce engagement—a possibility that this study's results suggest should not be overlooked. In conclusion, the findings demonstrate that transparency plays a complex, and in some cases, contradictory mediating role in the relationship between digitalization and public participation. While transparency is vital, it must be designed for public utility and engagement. The case of Ghana illustrates that without user-friendly systems, participatory frameworks, and inclusive communication strategies, transparency may fail to catalyze the participatory gains that digital governance promises. Future reforms must therefore integrate technology, institutional reform, and citizen empowerment in a unified, context-specific approach.

Table 9: The mediating role of transparency in the relationship between digitalization and revenue generation, public participation, and allocation efficiency

Dependent Variable: Public Participation				
Method: Least Squares				
Sample: 2010 2022				
Included observations: 13				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.43797	3.323422	4.344308	0.0025
Digitalization	-8.085880	5.367633	-1.506414	0.1704
Institutional Quality	-2.595236	2.496248	-1.039655	0.3289
Political Stability	0.427222	1.654799	0.258172	0.8028
Transparency In Governance	-1.422026	0.813331	-1.748397	0.0185
R-squared	0.650650	Mean dependent var		6.070769
Adjusted R-squared	0.475974	S.D. dependent var		0.734648
S.E. of regression	0.531809	Akaike info criterion		1.858658
Sum squared resid	2.262565	Schwarz criterion		2.075946
Log likelihood	-7.081275	Hannan-Quinn criter.		1.813995
F-statistic	3.724911	Durbin-Watson stat		1.509366
Prob(F-statistic)	0.003661			

PRACTICAL IMPLICATIONS

The findings from this study carry important practical implications for public sector governance, particularly in developing countries like Ghana that are pursuing digital transformation agendas. One of the most compelling insights is that digitalization alone is

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insufficient to enhance revenue generation, improve public participation, or achieve allocation efficiency. Rather, the success of digital initiatives is highly dependent on the presence of transparent, accessible, and trusted systems. Therefore, governments must shift focus from technology deployment to technology integration, ensuring that digital tools are designed and implemented alongside strong transparency measures. This includes simplifying public financial data, using user-friendly digital interfaces, and actively involving citizens in digital governance processes. Moreover, institutional actors, such as local government officials, must be trained not just in digital literacy but in strategies to leverage digitalization for transparency and citizen engagement. Without these complementary efforts, the potential benefits of digital governance are unlikely to be realized in full.

IMPLICATIONS FOR ACCOUNTING RESEARCH

The study also offers several implications for accounting research, particularly in the areas of public sector accounting and digital accountability. Traditional accounting literature has often centered on compliance, reporting, and audit effectiveness. However, this research underscores the need for a more dynamic understanding of how accounting systems interact with digital technologies and institutional transparency to influence fiscal performance and governance outcomes. Specifically, it highlights the role of transparency as a mediating construct that can amplify or suppress the effectiveness of digital systems in revenue generation and resource allocation. Future accounting research should therefore expand its scope to investigate how digital accounting tools—such as real-time budget tracking, open audit platforms, and e-tax systems—are not only implemented but interpreted and used by both internal and external stakeholders. This aligns with emerging research streams that position accounting as an enabler of institutional legitimacy and participatory governance in the digital age.

LIMITATIONS AND FUTURE WORK

Despite its contributions, the study is not without limitations, which present opportunities for future research. One primary limitation lies in the use of secondary macro-level data, which, although reliable, restricts the depth of insight into context-specific mechanisms—such as citizen perceptions, departmental implementation challenges, and intra-governmental coordination. This limitation could be addressed through mixed-methods research that combines quantitative modeling with qualitative interviews or focus groups, offering a richer understanding of how transparency and digitalization interact in practice. Additionally, the study is constrained by a relatively small sample size (13 years of annual data), which may limit the generalizability of the findings. Longer panel datasets or multi-country comparisons could enhance statistical robustness and reveal cross-national patterns. Furthermore, while transparency is modeled as a mediator in this study, future work could explore its role as a moderator or even a dependent variable, particularly in contexts where transparency itself is evolving due to institutional reforms.

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