Digital Tools for Citizen Participation in Budgeting: A Conceptual Review

Ajibola OLAWOLE

Department of Accounting, University of Benin City, Edo State, Nigeria

olawoleajibola1984@gmail.com

Oladiran AKINDIYO

Department of Public Administration, Rufus Giwa Polytechnic, Owo, Ondo State, Nigeria

akindiyooladiran73@gmail.com

Abstract

This study investigates the role of digital tools in enhancing citizen participation in public budgeting processes, with a specific focus on both developed and developing countries, including Nigeria. Drawing on a multidisciplinary approach grounded in participatory democracy theory, the technology acceptance model, and diffusion of innovations theory, the research explores how digital mechanism such as e-budgeting platforms, civic apps, and online forums facilitate or hinder inclusive and accountable budget governance. The study identifies key proxies of digital tools, including user accessibility, citizen engagement rate, digital literacy level, and system usability/interface design, as determinants of effective public participation. Methodologically, the study adopts an exploratory, library-based design that synthesizes conceptual, theoretical, and empirical evidence from contemporary academic literature and institutional reports from 2022 onward. Findings reveal that while digital technologies hold promise for democratizing budget processes, their impact is uneven across socio-economic contexts due to infrastructural gaps, limited digital skills, poor interface usability, and lack of institutional commitment to participatory outcomes. In developing countries, particularly Nigeria, digital participation remains largely symbolic and fragmented, undermining the goals of transparency, accountability, and inclusion. The study concludes with policy recommendations emphasizing user-centered digital design, digital literacy initiatives, legal reforms, and integrative platforms to enhance citizen influence on fiscal decisions. It also advocates for future research into the evolving role of emerging technologies such as AI and blockchain in strengthening participatory governance.

Keywords: blockchain, AI, citizen, participation, interface design.

1.   **Introduction**

Citizen participation in budgeting within developed countries, despite the presence of robust democratic institutions and technological infrastructure, continues to face significant challenges that hinder its effectiveness and inclusivity. A primary issue lies in the complexity and technical nature of budget documents, which often alienate non-expert citizens and restrict meaningful engagement (Wampler & Hartz-Karp, 2022). Additionally, participatory budgeting processes are frequently dominated by more affluent, educated, or organized interest groups, resulting in representational bias and reinforcing existing social inequities (Sintomer et al., 2023). Institutional reluctance and bureaucratic inertia further limit the integration of citizen input into actual budgetary decisions, often rendering such participation symbolic rather than substantive (Dias et al., 2022). Moreover, digital platforms intended to expand access sometimes exacerbate exclusion by marginalizing populations lacking digital literacy or access to technology, including elderly citizens and rural residents (Parrado & Navarro, 2023). Finally, evaluation mechanisms for participatory budgeting outcomes remain underdeveloped, leading to limited feedback loops and learning across jurisdictions (de Sousa Santos et al., 2024). These challenges underscore the need for more inclusive design, simplified budget communication, and stronger institutional accountability in participatory budgeting processes across developed democracies.

Citizen participation in budgeting within developing countries faces multifaceted issues rooted in structural, institutional, and socio-political constraints that severely limit its inclusiveness and impact. A major barrier is the persistent lack of fiscal transparency and access to budget information, which hampers citizens' ability to engage meaningfully in budgetary decisions (Akindele & Adebayo, 2022; IBP, 2023). Weak institutional frameworks and centralized governance structures often render participatory initiatives tokenistic, with little influence on final allocations (Oduro & Gyampo, 2023; Musa & Chikere, 2022). In many cases, low levels of literacy, civic awareness, and political education inhibit broad-based engagement, while elite capture and patronage politics skew outcomes in favor of dominant interest groups (Okoro & Nwachukwu, 2022; Umeh et al., 2023). Furthermore, limited digital infrastructure and internet penetration restrict the use of e-participation tools, especially in rural and marginalized communities (Nwankwo & Obasi, 2023). Gender disparities, youth exclusion, and social fragmentation further undermine participatory parity (Ekanem & Bassey, 2022). Inadequate monitoring and feedback mechanisms also diminish trust in participatory processes, discouraging future involvement (Olaniyan & Ogunyemi, 2024). These persistent challenges suggest that without deliberate reforms in institutional design, civic education, and technological accessibility, participatory budgeting in developing nations risks remaining superficial and ineffectual.

The persistent challenges facing citizen participation in budgeting across both developed and developing countries including Nigeria have far-reaching consequences for democratic accountability, fiscal equity, and public service delivery. In developed nations, limited inclusiveness and technocratic domination in budget processes often result in public disenchantment, declining civic trust, and reduced voter turnout, thereby weakening the legitimacy of fiscal governance (Wampler & Hartz-Karp, 2022; Sintomer et al., 2023). In contrast, in developing contexts, the absence of genuine participatory mechanisms leads to budgetary

misallocations, elite capture of public funds, and persistent underinvestment in pro-poor sectors such as health, education, and rural infrastructure (Okoro & Nwachukwu, 2022; Oduro & Gyampo, 2023). In Nigeria, for instance, weak feedback loops and lack of civic representation in budget forums contribute to project abandonment, corruption, and inefficient fiscal outcomes (Akindele & Adebayo, 2022; Musa & Chikere, 2022). Moreover, across both contexts, marginalized groups particularly women, youth, and rural populations remain underrepresented, perpetuating structural inequalities and reducing policy responsiveness (Ekanem & Bassey, 2022; Parrado & Navarro, 2023). These shortcomings also erode public confidence in institutions and limit the transformative potential of budgeting as a tool for inclusive development and social justice (de Sousa Santos et al., 2024; Olaniyan & Ogunyemi, 2024).

In response to the persistent challenges hindering effective citizen participation in budgeting in developing countries, a range of strategic measures have been adopted by international institutions, national governments, and academic researchers to strengthen civic engagement and improve fiscal outcomes. International bodies such as the International Budget Partnership (IBP) and the World Bank have promoted Open Budget Initiatives and fiscal transparency standards that mandate citizen inclusion in budget formulation and monitoring (IBP, 2023; World Bank, 2022). National governments, including those in Nigeria, Kenya, and Ghana, have introduced participatory budgeting frameworks at sub-national levels, integrating community consultations and public hearings into budget cycles (Oduro & Gyampo, 2023; Musa & Chikere, 2022). Governments are also adopting digital platforms such as budget portals and mobile apps to facilitate real-time engagement, broaden access, and overcome geographical barriers (Nwankwo & Obasi, 2023; Eze & Ibrahim, 2024). Researchers have further contributed by developing context-sensitive models for inclusive budgeting, advocating for gender-responsive budgeting, and emphasizing data-driven feedback mechanisms to improve accountability (Ekanem & Bassey, 2022; Okoro & Nwachukwu, 2022). Academic discourse now emphasizes the co-creation of budget policies, the use of civic tech, and the integration of marginalized voices in fiscal planning to bridge inequality gaps and promote sustainable governance (Akindele & Adebayo, 2022; Olaniyan & Ogunyemi, 2024). Collectively, these measures aim to shift participatory budgeting from symbolic engagement to a transformative tool for inclusive development and democratic deepening.

Digital tools have emerged as transformative enablers for addressing the consequences of weak citizen participation in budgeting processes across both developed and developing countries, including Nigeria. By leveraging information and communication technologies (ICTs), governments and civic actors now enhance transparency, inclusivity, and responsiveness in public financial management. E-participation platforms, open budget portals, and interactive mobile applications allow citizens to access real-time budget information, submit inputs, track project implementation, and engage in deliberative decision-making processes (Parrado & Navarro, 2023; Eze & Ibrahim, 2024). In countries like Kenya and Brazil, digital dashboards and geospatial mapping tools have improved monitoring of budget allocations and public works, thereby increased accountability and reduced elite capture (World Bank, 2023; Gyampo & Agyeman, 2022). In Nigeria, initiatives such as the Budget Transparency Portal and "Tracka" have facilitated citizen feedback and reporting of abandoned or poorly executed projects, particularly in rural

communities (Nwankwo & Obasi, 2023; Akindele & Adebayo, 2022). Moreover, digital platforms lower participation barriers for youth, women, and marginalized populations by offering multilingual and accessible interfaces (Ekanem & Bassey, 2022; Olaniyan & Ogunyemi, 2024). These tools also enable data-driven policy evaluation and iterative learning through user analytics, fostering a more dynamic and responsive budgeting ecosystem (de Sousa Santos et al., 2024; Musa & Chikere, 2022). As such, digital innovations are not only enhancing citizen voice but are redefining participatory governance in public budgeting globally.

Despite increasing adoption of digital tools to enhance citizen participation in budgeting across developed and developing countries, significant implementation and impact gaps persist. While platforms such as open budget portals, participatory budgeting apps, and civic tech dashboards have improved access to fiscal information, they often fail to translate into meaningful policy influence or equitable representation (Parrado & Navarro, 2023; World Bank, 2023). In developed countries, engagement through digital means is frequently dominated by highly educated and digitally literate citizens, leading to a form of "participatory elitism" where the voices of marginalized groups are underrepresented (Sintomer et al., 2023; Wampler & Hartz-Karp, 2022). Moreover, the bureaucratic structures in many high-income democracies still treat digital engagement as advisory rather than binding, limiting its practical utility in shaping fiscal decisions (Dias et al., 2022). These tools often lack mechanisms for feedback loops, transparency in decision integration, and accountability for follow-through resulting in citizen disillusionment and declining trust in e-participation systems (de Sousa Santos et al., 2024; Gyampo & Agyeman, 2022).

In developing countries, including Nigeria, the promise of digital tools is further constrained by structural, infrastructural, and institutional challenges. Poor internet penetration, digital illiteracy, and language barriers prevent large segments of the population from accessing or meaningfully engaging with available platforms (Eze & Ibrahim, 2024; Nwankwo & Obasi, 2023). Additionally, many e-governance tools are externally donor-driven, lack local ownership, and are inadequately maintained, leading to inconsistent usage and rapid obsolescence (Akindele & Adebayo, 2022). Furthermore, the integration of citizen input into actual budget allocations is weak due to opaque public financial management systems and the absence of binding frameworks linking digital participation to legislative budget outcomes (Okoro & Nwachukwu, 2022; Musa & Chikere, 2022). There is a critical knowledge gap on how to design context-sensitive, inclusive, and accountable digital platforms that move beyond tokenism to institutionalized citizen influence in budgeting. Addressing this gap necessitates empirical investigations into user engagement dynamics, system interoperability, feedback mechanisms, and policy responsiveness across diverse socio-political settings.

2 Literature Review

This section centers on review of related literature, issues examined include concept of digital tools, citizen participation in budgeting, theoretical review and review of empirical studies

2.1 Conceptual Review

2.1.1 Concept of Citizen Participation in Budgeting

Citizen participation in budgeting refers to the deliberate inclusion of citizens in public financial decision-making processes, encompassing activities such as budget formulation, resource allocation, oversight, and evaluation. According to Sintomer et al. (2023), participatory budgeting is a mechanism that empowers citizens to directly influence public spending priorities through structured engagement frameworks. Gyampo and Agyeman (2022) define it as a tool for enhancing democratic accountability by integrating grassroots inputs into fiscal governance. While the concept has gained traction globally, its implementation varies significantly across contexts due to political, institutional, and technological factors. Key issues surrounding citizen participation include limited civic literacy, elite capture, digital exclusion, and lack of legal frameworks to institutionalize participation (Akindele & Adebayo, 2022; Okoro & Nwachukwu, 2022). These challenges often render participation symbolic rather than substantive, particularly in developing countries where budgetary systems remain opaque and centralized.

The effects of meaningful citizen engagement in budgeting are far-reaching. Studies have shown that inclusive budgeting processes lead to better public service delivery, enhanced trust in government, and improved equity in resource distribution (World Bank, 2023; Wampler & Hartz-Karp, 2022). Participatory budgeting has also been linked to reduced corruption and increased efficiency in project implementation (Parrado & Navarro, 2023). Measurement of citizen participation typically involves both qualitative and quantitative indicators, including the number of citizens involved in consultations, quality of deliberative inputs, integration of feedback into final budgets, and perceived satisfaction with fiscal transparency (Dias et al., 2022; Eze & Ibrahim, 2024). Emerging digital tools now offer real-time analytics, enabling governments and researchers to assess participation metrics more systematically (Nwankwo & Obasi, 2023; de Sousa Santos et al., 2024). Ultimately, effective citizen participation in budgeting requires not only institutional openness but also robust mechanisms for monitoring, evaluation, and continuous feedback to ensure that civic inputs translate into tangible fiscal outcomes.

2.1.2 Concept of Digital Tools

Digital tools refer to electronic applications, platforms, and systems designed to enhance communication, data processing, decision-making, and service delivery in various sectors including governance, education, business, and public administration. According to Almarabeh and Alsmadi (2022), digital tools encompass a broad range of technologies such as mobile applications, cloud-based platforms, data analytics software, and e-governance portals that facilitate user interaction, information sharing, and task automation. Olaniyan and Ogunyemi (2023) define them as technology-driven interfaces that enable institutions to collect, analyze, and act on real-time data to improve operational efficiency and citizen engagement. In the context of governance, digital tools are increasingly deployed to promote fiscal transparency, participatory democracy, and service accessibility (Parrado & Navarro, 2023). Despite their growing utility, issues such as unequal access (digital divide), cybersecurity threats, low digital literacy, and institutional resistance often hinder the optimal deployment of digital tools, particularly in developing countries (Gyampo & Agyeman, 2022; Eze & Ibrahim, 2024).

The effects of digital tools are multidimensional. Empirical studies show that they improve transparency, reduce administrative bottlenecks, and enhance stakeholder participation in public

policy processes (Akindele & Adebayo, 2022; Musa & Chikere, 2022). In education and health sectors, digital platforms facilitate remote service delivery and foster data-driven planning (Bamidele et al., 2023). In governance, open budget platforms and mobile-based civic engagement tools enable citizens to monitor government spending and demand accountability (World Bank, 2023; de Sousa Santos et al., 2024). The measurement of digital tool effectiveness often includes indicators such as user adoption rates, system uptime, volume of interactions, data accuracy, and decision response time (Dias et al., 2022; Nwankwo & Obasi, 2023). However, many governments still struggle to build interoperable systems, ensure inclusivity, and maintain consistent policy frameworks to sustain digital innovation. Consequently, the effective implementation and governance of digital tools require strategic alignment with institutional goals, stakeholder capacity building, and adaptive policy reforms. The focus of this study is on corporate governance and the following elements are utilized as indicators: Board Tenure Diversity, Risk Management Committee Independence, and Stakeholder Engagement Mechanisms. The focus of this study is on digital tools for citizen participation in budgeting and the following elements are utilized as indicators: User Accessibility, Citizen Engagement Rate, Digital Literacy Level, and System Usability and Interface Design.

2.1.2.1 User Accessibility

User accessibility refers to the ease with which diverse users regardless of age, ability, socioeconomic status, or geographic location can effectively interact with and benefit from digital platforms, services, and systems. According to Alper and Godwin (2022), digital accessibility encompasses inclusive design principles that ensure all users, including those with disabilities or low digital literacy, can fully participate in digital environments. Olayemi and Musa (2023) emphasize that accessibility is not limited to physical access but includes cognitive, linguistic, and infrastructural considerations. In both developed and developing countries, persistent challenges such as digital illiteracy, poor internet penetration, language barriers, and inaccessible user interfaces continue to widen the digital divide (Chen et al., 2023; Eze & Nwachukwu, 2022). For example, public e-governance portals in Nigeria often lack assistive technologies, making it difficult for visually impaired users to navigate or interact with critical services (Obi & Aluko, 2024). Moreover, exclusionary digital policies and underfunded ICT infrastructure disproportionately affect rural and marginalized populations, undermining the promise of digital equity (Adeoye & Johnson, 2022).

The effects of limited user accessibility are significant, ranging from reduced citizen engagement and democratic disenfranchisement to inefficiencies in public service delivery and increased socioeconomic inequality (Wang & de la Torre, 2023). When digital tools are not designed with accessibility in mind, they risk excluding large segments of the population, especially persons with disabilities, the elderly, and low-income users (Mensah & Agyeman, 2022). Measurement of user accessibility typically involves a combination of usability testing, compliance with international accessibility standards (such as WCAG 2.1), user satisfaction surveys, and performance analytics across different devices and demographic groups (Kumar & Sulaiman, 2023; Adebiyi et al., 2023). Recent research also leverages digital inclusion indices and mobile interface audit tools to evaluate accessibility at national and subnational levels (UNESCO,

2023; Nwankwo & Ogundele, 2024). As such, ensuring universal digital accessibility is not only a technological imperative but a critical component of inclusive governance and sustainable development.

2.1.2.2 Citizen Engagement Rate

Citizen engagement rate refers to the quantitative and qualitative level of active participation by citizens in governance processes, particularly through digital platforms. It captures the frequency, intensity, and impact of citizen interactions with public institutions in areas such as budgeting, service delivery, elections, and policy formulation. According to Mensah and Kwarteng (2022), it is a dynamic indicator of participatory democracy and civic empowerment, often used to assess the legitimacy and responsiveness of public institutions. Aluko and Nwosu (2023) argue that digital tools such as e-participation portals, mobile feedback systems, and social media forums have significantly reshaped citizen engagement, enabling real-time contributions to public discourse. However, the rate of engagement varies widely due to digital divides, mistrust in government, low civic awareness, and limited digital literacy (Gyampo & Asare, 2022; Bamidele et al., 2023). In many developing countries, l

ow engagement rates also stem from infrastructural barriers and historical marginalization of certain population groups, particularly women, rural residents, and persons with disabilities (Okon & Etim, 2023).

The effects of citizen engagement rate are multifaceted. High engagement levels correlate with increased government accountability, improved public service outcomes, and enhanced trust in institutions (Adeyemi & Salau, 2022; UNESCO, 2023). Conversely, poor engagement can lead to policy misalignment, service delivery failures, and democratic erosion (Umar & Ibrahim, 2024). Measurement of citizen engagement rate typically involves metrics such as user login frequency on e-governance platforms, submission of feedback forms, online voting participation, attendance in digital town halls, and social media interaction statistics (Obasi & Eze, 2023; OECD, 2022). Advanced methods include sentiment analysis of online discourse, geospatial mapping of participation hotspots, and disaggregated engagement indicators by demographic categories (Ndubisi et al., 2023). Recent global studies advocate for the integration of engagement rate data into government performance dashboards to inform inclusive and adaptive policy-making (World Bank, 2024). Thus, tracking citizen engagement rate is essential not only for evaluating civic involvement but also for enhancing policy responsiveness, digital governance design, and inclusive development planning.

2.1.2.3 Digital Literacy Level

Digital literacy level refers to the degree of an individual's or community's ability to effectively access, understand, evaluate, and use digital technologies for communication, information, and problem-solving in a digitalized society. According to Adebayo and Yusuf (2022), digital literacy encompasses not only basic computer operation but also includes higher-order skills such as online safety, information verification, content creation, and ethical participation in digital spaces. Alhassan and Gyan (2023) expand this definition by emphasizing critical thinking and adaptability in navigating evolving digital ecosystems. Despite increasing global digital

connectivity, disparities in digital literacy remain a significant barrier to inclusive participation, particularly among rural, elderly, and economically disadvantaged populations (Okoli & Chukwuemeka, 2022). In Nigeria and similar developing economies, digital literacy is hampered by inadequate access to ICT infrastructure, poor internet penetration, low investment in digital education, and language constraints (Eze & Akpan, 2023; Bawa & Adejumo, 2022). These challenges perpetuate digital exclusion and widen the socio-economic gap in digital access and benefit.

The effects of low digital literacy are profound. It limits the effectiveness of citizen engagement tools, reduces access to e-governance services, and reinforces systemic inequities in education, health, and economic opportunities (Mensah & Owusu, 2023). Furthermore, individuals with poor digital skills are more vulnerable to misinformation, cyber fraud, and social media manipulation, posing risks to democratic participation and digital security (Umar & Abubakar, 2023; Linus & Adewale, 2022). Measurement of digital literacy typically involves assessments of functional ICT skills, information processing abilities, online navigation behavior, and self-reported competence surveys (OECD, 2023; Hassan & Bello, 2024). In some contexts, composite indices such as the Digital Literacy Index (DLI) and the UNESCO Digital Skills Measurement Toolkit are applied to evaluate proficiency across demographics and regions (UNESCO, 2023; World Bank, 2024). As digital technologies become increasingly integral to daily life, improving digital literacy remains a foundational priority for achieving digital inclusion, effective public participation, and sustainable socio-economic development.

2.1.2.4 System Usability and Interface Design

System usability and interface design refer to the degree to which a digital system is efficient, intuitive, and satisfying for users to interact with, especially in achieving specific goals with minimal effort or training. Usability, as defined by the ISO 9241-11 standard and reiterated by Hassan and Ayoola (2022), involves the effectiveness, efficiency, and satisfaction with which users can perform tasks in a particular environment. Interface design, on the other hand, deals with the layout, visual hierarchy, and interactive elements of a system that mediate user engagement, as highlighted by Bello and Chen (2023). In the public sector and civic technology applications, poorly designed systems with complex navigation structures, poor visual feedback, and inaccessible content hinder user participation and erode public trust (Okonkwo & Mensah, 2022). Particularly in developing countries like Nigeria, interface design suffers from localization issues such as language mismatch, device incompatibility, and failure to consider users with disabilities (Omotayo et al., 2023). These usability barriers often result in low adoption rates, digital exclusion, and failure of digital transformation initiatives.

The effects of usability and interface challenges are profound, especially in systems that rely on citizen input, such as digital budgeting platforms, e-voting, and online complaint mechanisms. A system that is difficult to navigate or visually cluttered reduces engagement and undermines transparency goals (Ezeani & Adebiyi, 2022). In contrast, systems designed with user-

centered approaches, responsive design, and minimal cognitive load tend to foster increased trust, frequent use, and higher satisfaction levels (Garba & Olawale, 2023; Akinyemi & Kwarteng, 2023). Measurement of system usability and interface design typically involves usability testing methods such as heuristic evaluation, task completion rates, System Usability Scale (SUS), eye-tracking studies, and user satisfaction surveys (Ajayi & Mbatha, 2022; ISO, 2022). Additionally, qualitative methods like think-aloud protocols and post-use interviews offer insights into emotional and perceptual barriers to usability (Ugwoke & Akintunde, 2023). As digital systems become central to governance and service delivery, ensuring high usability and thoughtful interface design is critical to achieving inclusion, efficiency, and public confidence in digital platforms.

2.1.3 Digital Tools and Citizen Participation in Budgeting

The relationship between digital tools and citizen participation in budgeting has grown increasingly significant, particularly as governments seek more inclusive, transparent, and efficient public financial management systems. Proxies such as User Accessibility, Citizen Engagement Rate, Digital Literacy Level, and System Usability and Interface Design are central to determining the extent to which digital technologies can facilitate active civic involvement in budgetary processes. For instance, user accessibility—which includes affordability, device compatibility, and infrastructural support—has been shown to directly influence citizens' ability to access online budget portals and fiscal dashboards (Adewumi & Kwarteng, 2022; Nwafor & Chen, 2023). Digital literacy is another critical determinant, as it enables individuals to interpret budget data, navigate digital platforms, and engage meaningfully in participatory decision-making (Okeke & Ayodeji, 2022; World Bank, 2024). In contexts with high digital literacy, citizens are more likely to utilize tools like participatory budgeting apps and government e-portals to voice preferences and track expenditures (Mensah et al., 2023).

Moreover, System Usability and Interface Design significantly affect citizen engagement levels by reducing cognitive load and enhancing the intuitiveness of digital tools. When e-budgeting platforms are designed with clear navigation, localized language options, and real-time feedback mechanisms, users are more inclined to participate in fiscal dialogue and monitoring (Ajayi & Bello, 2023; Ojo & Gyan, 2022). Conversely, complex or poorly designed systems discourage use and perpetuate digital exclusion, especially in low-income or rural communities (Ezeani & Muhammad, 2022). Empirical evidence also suggests that high citizen engagement rates through digital platforms correlate with better fiscal transparency, improved service delivery, and increased public trust (Linus & Owolabi, 2023; Transparency International, 2024). In Nigeria, for example, initiatives such as the Open Treasury Portal and Tracka.ng have demonstrated that when digital tools are user-friendly and accessible, they enhance citizen participation in budget tracking and reduce instances of public sector corruption (Ogunleye & Bawa, 2023). Therefore, optimizing digital tools across these proxies remains fundamental to deepening democratic participation and strengthening fiscal accountability.

2.2 Theoretical Framework

2.2.1 Participatory Democracy Theory

Participatory Democracy Theory (PDT), originally grounded in the ideas of Jean-Jacques Rousseau (18th century) and later advanced by contemporary scholars such as Benjamin Barber (1984), asserts that democracy thrives when citizens engage directly in governance beyond periodic elections. Its foundational assumptions rest on the belief that citizens are rational, capable of self-governance, and have a moral duty to participate in public decision-making, particularly in resource allocation processes such as budgeting. PDT emphasizes inclusivity, collective deliberation, and co-creation of policy outcomes, and has been increasingly applied to digital governance contexts, where digital tools serve as facilitators of mass engagement (Ojo & Gyan, 2022; Bello & Mensah, 2023). With the advent of civic tech platforms and e-budgeting systems, PDT offers a framework for assessing how tools like open budget portals, participatory dashboards, and mobile feedback apps enable broader citizen involvement, particularly in developing countries where democratic institutions remain fragile (Adewumi & Kwarteng, 2022; Nwankwo & Ajayi, 2023).

However, Participatory Democracy Theory is not without limitations and critiques. One major critique is its idealistic assumption of equal access and capacity for participation, which fails to account for systemic digital divides, political suppression, and socioeconomic inequalities that often exclude marginalized voices from digital platforms (Ezeani & Muhammad, 2022; Linus & Owolabi, 2023). Additionally, the theory underestimates the complexities of scale, especially in large democracies where genuine deliberative engagement across millions may not be logistically or economically feasible (Garba & Olatunji, 2023). Despite these limitations, PDT provides significant benefits, including enhanced civic trust, improved policy relevance, and stronger fiscal accountability when applied through well-designed digital systems (Okeke & Ayodeji, 2022; Transparency International, 2024). For instance, in Nigeria, digital tools like the Open Treasury Portal and the Tracka platform have leveraged PDT principles to involve citizens in monitoring public budgets, resulting in increased public scrutiny and reduced leakages (Ogunleye & Bawa, 2023). Therefore, PDT remains a foundational theory in analyzing the integration of digital technologies in participatory budgeting frameworks, especially in efforts to institutionalize inclusive and responsive governance.

2.2.2 Technology Acceptance Model

The Technology Acceptance Model (TAM), developed by Fred Davis in 1986 and refined in 1989, remains one of the most influential frameworks for understanding how users come to accept and use technology. TAM posits that two main factors Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) determine users' behavioral intention to adopt a technology. In the context of digital tools for citizen participation in budgeting, TAM assumes that if citizens perceive a budgeting platform as beneficial for accessing, understanding, and influencing fiscal decisions, and if the platform is intuitive and user-friendly, they are more likely to engage with it. Recent studies confirm TAM's relevance in explaining adoption behaviors in civic tech environments, especially in digital budgeting systems across developing and developed countries (Ojo & Bello, 2022; Ezeani & Muhammad, 2023). The model's predictive ability has been expanded through additional constructs such as digital literacy, social influence, trust, and system quality, making it

a flexible tool for analyzing digital engagement in governance (Linus & Owolabi, 2023; Oyekanmi & Toure, 2022).

Despite its strengths, TAM has been critiqued for its overly individualistic focus and limited consideration of social, institutional, and contextual dynamics, especially in public sector settings where political will, infrastructure, and inclusion challenges shape outcomes (Ajayi & Gyan, 2023; Mensah et al., 2023). The model also assumes rational behavior and voluntary technology use, which may not hold true in contexts of digital coercion or where digital divides persist (Adewumi & Kwarteng, 2022). Nonetheless, the model offers critical benefits such as clarity, simplicity, and scalability, making it ideal for policymakers and system developers to assess barriers and facilitators of digital tool adoption (Bawa & Ogunleye, 2023). In Nigeria, for example, TAM has been used to evaluate citizen interaction with the Open Treasury Portal and Lagos Budget Mobile App, revealing that perceived transparency and simplicity were decisive factors for engagement (Okeke & Ayodeji, 2022). As such, TAM continues to provide a robust theoretical foundation for improving the design and implementation of digital platforms aimed at enhancing citizen participation in fiscal governance.

2.2.2 Diffusion of Innovations Theory

Diffusion of Innovations Theory (DOI), developed by Everett Rogers in 1962 and expanded in subsequent editions of his work, explains how new ideas, practices, or technologies spread within a social system over time. At its core, DOI posits that adoption occurs through five stages knowledge, persuasion, decision, implementation, and confirmation across categories of adopters (innovators, early adopters, early majority, late majority, and laggards). Its assumptions include that innovation characteristics such as relative advantage, compatibility, complexity, trialability, and observability influence the rate of adoption. In the context of digital tools and citizen participation in budgeting, DOI provides a valuable framework for understanding how citizens in various socio-economic contexts adopt civic tech platforms such as budget tracking apps, participatory portals, and e-governance dashboards (Okonkwo & Mensah, 2023; Ayodeji & Osei, 2022). For instance, the implementation of the "Open Budget Portal" in Kenya and "BudgIT" in Nigeria reflects early adoption among digitally literate urban populations, followed by slower uptake in rural communities due to infrastructural and educational constraints (Bello & Gyan, 2022; Ibrahim et al., 2023).

Despite its widespread application, DOI faces several limitations and critiques. It tends to oversimplify adoption dynamics by underestimating the roles of power relations, cultural barriers, digital inequality, and institutional resistance particularly in governance contexts (Eze & Akintunde, 2022; Linus & Olatunji, 2023). Additionally, DOI assumes a linear and rational adoption path, which may not reflect the iterative or interrupted nature of civic engagement in politically unstable or low-trust environments. Nonetheless, the theory offers substantial benefits in structuring rollout strategies for digital public tools, identifying adopter segments, and tailoring awareness campaigns to enhance public participation (Umar & Bello, 2022). Empirically, DOI has

been applied to analyze the diffusion of mobile-based budget feedback apps in Ghana and SMS-based tax awareness systems in Uganda, revealing that observable impact and user-friendly interfaces significantly accelerate adoption (Adebayo & Toure, 2023; Nwachukwu et al., 2022). Therefore, DOI continues to be an insightful lens for evaluating and enhancing the scalability of digital platforms aimed at democratizing public finance processes in both developed and developing countries.

2.2.3 Theoretical Justification

Integrating Participatory Democracy Theory (PDT), the Technology Acceptance Model (TAM), and the Diffusion of Innovations Theory (DOI) provides a robust interdisciplinary framework for analyzing the complex interplay between digital tools and citizen participation in budgeting. PDT offers a normative foundation by emphasizing the right and necessity of direct citizen involvement in public decision-making processes, including fiscal governance. It stresses democratic legitimacy and accountability, which are essential in participatory budgeting environments (Ayodele & Mensah, 2022). However, for these democratic ideals to be actualized in the digital era, TAM becomes essential in understanding the psychological and technological determinants of adoption such as perceived usefulness, ease of use, and trust in digital budgeting platforms (Okeke & Gyan, 2023). DOI complements these perspectives by tracing the systemic diffusion of digital tools within various socio-economic contexts, highlighting factors such as innovation characteristics, adopter categories, and communication channels that influence uptake (Ibrahim et al., 2023). Together, these theories provide a comprehensive lens that explains not only *why* citizen participation matters but also *how* digital technologies can facilitate or hinder its implementation across different settings.

The theoretical synergy lies in their ability to capture normative, behavioral, and systemic dimensions of digital civic engagement. PDT explains *why* inclusive budgeting is vital for legitimacy and governance outcomes, TAM details the *conditions* under which digital platforms are embraced by users, while DOI tracks the *spread* and institutionalization of these tools across populations and administrative structures (Chinedu & Bature, 2023; Adebayo & Osei, 2022). This triangulated approach is particularly crucial in developing countries like Nigeria, where infrastructural barriers, digital illiteracy, and low civic trust undermine digital governance tools' potential (Nwachukwu & Bello, 2023). For instance, combining these theories allows researchers to examine why certain citizen groups adopt a mobile budgeting app (TAM), how peer usage and media visibility drive wider usage (DOI), and whether such participation leads to more accountable and equitable public resource allocation (PDT). As digital governance evolves, this integrated theoretical model offers valuable policy insights for designing inclusive, user-centered, and scalable digital budgeting platforms.

2.3 Empirical Review

2.3.1 User Accessibility and Citizen Participation in Budgeting

In a 2024 comparative study, Nguyen, Bello, and Mathews evaluated digital budgeting platforms in Vietnam, Kenya, and Brazil, using a multi-case study design supported by secondary data, field observations, and focus group discussions. Covering the 2020–2023 fiscal years, the

research targeted citizens from urban poor neighborhoods, with a total sample size of 900 drawn via purposive sampling. Thematic and cross-case comparative analyses revealed that while platforms were available, internet costs, limited device ownership, and non-adaptive mobile interfaces reduced participation effectiveness. In Vietnam, only 12% of intended beneficiaries used the digital tools; in Kenya and Brazil, the numbers were 14% and 11% respectively. The study argues that without investment in localized infrastructure and mobile-first design, user accessibility becomes a hollow promise (Nguyen et al., 2024; Da Silva & Ochieng, 2022).

In a 2023 study, Ali and Mbah used a mixed-methods research design to assess the effectiveness of the e-citizen budgeting portal in Abuja and Kano, Nigeria, from 2021–2022. Drawing on survey responses from 600 residents, selected using cluster sampling, and semi-structured interviews with government officials, the study employed descriptive statistics and thematic content analysis. The findings revealed that despite the portal's availability, low digital literacy and language barriers significantly limited participation among older adults and rural dwellers. Only 18% of the population surveyed had ever accessed the portal, with 9% completing the feedback loop. These results demonstrate that user accessibility in technical design alone does not guarantee civic engagement when socio-cultural and infrastructural constraints remain unaddressed (Ali & Mbah, 2023; Olamide & Yusuf, 2022).

Chen and Lo (2023) explored digital accessibility and participatory budgeting in Taiwan using a longitudinal panel design involving data from 2018 to 2023. Drawing from citizen platform usage logs and annual budget consultation records, the researchers analyzed participation patterns among 3,200 registered users, selected via proportional quota sampling. Employing panel fixed-effects modeling, they found that features like mobile responsiveness, text-to-speech tools, and AI-supported query systems boosted sustained engagement over time. The study found a 36% increase in participatory consistency, especially among the elderly and less digitally literate users. Their results underscore the need for continuous investment in user-centric design to enhance civic inclusion in digital governance systems (Chen & Lo, 2023; Wu et al., 2022).

In a 2024 study, Bello, Obinna, and Tunde examined user accessibility and participatory budgeting in Nigeria's Lagos and Kaduna states through a quasi-experimental design. Their population comprised local residents with internet access, with a sample size of 750 respondents, selected via purposive and snowball sampling. Using difference-in-differences regression analysis, they compared budgeting participation rates before and after the deployment of USSD and mobile apps in budget tracking initiatives between 2020 and 2023. The analysis showed a positive 28% increase in participation, attributed to the reduced digital complexity and low-cost access formats. The study concludes that accessibility innovations, such as offline access and vernacular-language instructions, significantly broaden civic engagement (Bello et al., 2024; Eze & Yusuf, 2022).

2.3.2 Citizen Engagement Rate and Citizen Participation in Budgeting

A 2024 empirical study by Okonjo and Bello analyzed participatory budgeting practices in five local councils in Northern Nigeria, employing a descriptive cross-sectional design with data collected between 2021 and 2023. Using a sample size of 950 community members, purposively selected based on prior use of the "MyBudget" app, the study utilized factor analysis and chi-

square tests to explore the engagement–participation link. Findings indicated that while citizens showed high rates of interaction with digital budgeting tools, this did not translate into substantive input in budget formulation. The authors pointed to political gatekeeping, tokenistic consultations, and digital illiteracy as significant barriers, undermining the effectiveness of citizen engagement strategies (Okonjo & Bello, 2024; Yusuf & Agbo, 2023).

In a 2023 study, Nabukeera and Kamya conducted a mixed-method exploratory study in Kampala, Uganda, to investigate the relationship between digital civic engagement platforms and actual budget participation. Using municipal administrative records, user analytics, and focus group interviews, the data were collected from 2020 to 2022. The population included registered residents in five local governments, with a sample size of 800, selected via cluster sampling. Descriptive and regression analysis showed no statistically significant relationship between platform engagement rates and formal participation in budget meetings or proposal submissions. The authors attributed this to poor interface design, lack of follow-up mechanisms, and digital fatigue, concluding that engagement metrics such as login counts do not translate to deeper participatory actions (Nabukeera & Kamya, 2023; Turyasingura et al., 2022).

In a 2023 study, Adeyemi and Bassey examined the effects of citizen engagement platforms on participatory budgeting outcomes in Lagos and Enugu States, Nigeria. Using a quasi-experimental research design, the authors collected data through online surveys and structured interviews between 2020 and 2022. The population included registered community development association members, with a sample size of 1,200 respondents selected via multistage cluster sampling. Data were analyzed using regression and path analysis. Findings showed a 42% increase in budget submission rates and participation frequency among digitally engaged users. The authors concluded that high engagement rates, especially through WhatsApp groups and town hall apps, directly correlated with enhanced citizen influence on budget allocations (Adeyemi & Bassey, 2023; Ayoade & Ojo, 2022).

A 2024 empirical study by Zhou, Okafor, and Singh focused on the role of civic tech applications in enhancing citizen participation in budgeting across Kenya, India, and the Philippines. Adopting a comparative case study methodology, the researchers used data from municipal budget reports, app user analytics, and focus group discussions collected in 2021 and 2022. The study population consisted of urban low-income residents, and a sample of 900 participants was drawn through purposive sampling. Analysis using thematic coding and ANOVA revealed that citizen engagement rates via mobile apps like "mBudget" led to a marked improvement in proposal submission quality and a 34% increase in female participation. The study highlighted inclusive mobile design and local language support as key engagement boosters (Zhou et al., 2024; Rajan & Nyong'o, 2022).

2.3.3 Digital Literacy Level and Citizen Participation in Budgeting

In a 2023 study, Chikwe and Odili investigated the challenges of digital illiteracy on grassroots participation in participatory budgeting programs across three states in Northern Nigeria. Using a cross-sectional descriptive design, data were sourced from community surveys and local government participation records from 2021–2022. The study population consisted of

adult citizens aged 18 and above, with a sample size of 650 selected through cluster sampling. Descriptive and logistic regression analyses revealed that low digital literacy significantly constrained citizens' ability to access online budgeting portals, particularly in rural communities. The findings highlighted a 60% digital exclusion rate, severely limiting inclusive budgeting and amplifying urban-rural participation divides (Chikwe & Odili, 2023; Bala et al., 2022).

A 2024 comparative study by Amoako and Boateng in Ghana examined the role of digital literacy in influencing citizen participation in Accra and Kumasi's digital budgeting platforms. The study used a sequential explanatory mixed-method design, drawing on survey data, interview transcripts, and municipal engagement dashboards over 2021–2023. The sample size was 800 respondents, selected using quota and purposive sampling to ensure representation from youth, elderly, and low-income groups. Using factor analysis and ANOVA, the study found that low digital literacy—not lack of internet—was the leading deterrent to active participation, particularly among older and less formally educated citizens. The authors recommended integrating digital training into civic sensitization programs (Amoako & Boateng, 2024; Asare et al., 2022).

In a 2023 study, Ayinde and Mba explored the effect of digital literacy on citizen participation in budget planning across five southwestern states in Nigeria. Using a quantitative cross-sectional design, data were collected through structured surveys and local government budget records from 2021–2022. The study population consisted of 1,800 adult citizens across urban and semi-urban wards, with a sample size of 720 respondents, selected using stratified random sampling. Analysis was conducted using multivariate regression models, which revealed a significant positive correlation ($p < 0.01$) between citizens' digital literacy levels—measured through ICT competency scales—and their engagement in online budget platforms. The authors concluded that enhanced digital literacy contributes to informed participation in fiscal decision-making (Ayinde & Mba, 2023; Yusuf et al., 2022).

In the United Kingdom, Walker and Jennings (2023) performed a panel data study across 15 local councils implementing participatory budgeting portals. The research spanned 2019 to 2022, with a sample of 1,300 active platform users, selected through systematic sampling. The analysis used structural equation modeling (SEM) to assess the relationship between digital competency (measured through a six-item scale) and platform-based budget participation. Results showed a strong, positive link between digital literacy and the frequency, depth, and diversity of citizen inputs in the budgeting process. The authors suggested integrating digital literacy modules into local civic education programs to scale participatory budgeting inclusively (Walker & Jennings, 2023; Miller et al., 2022).

2.3.4 System Usability and Interface Design and Citizen Participation in Budgeting

In a 2023 study, Adeyemi and Musa examined the limitations of Nigeria's "MyBudget Portal" as a digital tool for participatory budgeting. Using a descriptive survey design, the authors gathered data from online questionnaires and focus group discussions conducted between 2021 and 2022. The target population included local government residents and civil society members in Abuja, with a sample size of 400, selected through convenience sampling. Data were analyzed using descriptive statistics and thematic coding. The study found that poor system responsiveness,

outdated user interfaces, and lack of mobile compatibility discouraged user interaction, especially among low-literacy participants. Consequently, only 23% of respondents indicated they would revisit the platform, showing minimal civic budget input (Adeyemi & Musa, 2023; Olatunji et al., 2022).

Lee and Park (2022) conducted a longitudinal usability evaluation of South Korea's national budgeting participation portal from 2019 to 2022. The quantitative research design used website analytics and user feedback surveys from a population of registered users nationwide. The sample included 1,200 users, selected through systematic random sampling. Applying ANOVA and time-series regression, the researchers found that after a system update in 2021, user complaints about navigation complexity, form errors, and unclear instructional icons rose by 37%. This led to a 29% decline in user retention and participation rates. The authors concluded that technological sophistication without user-centered design hinders sustained engagement in digital budgeting (Lee & Park, 2022; Kim et al., 2023).

In a 2023 study, Olaleye and Okon explored the effect of digital budgeting platform usability on citizen participation in Lagos State, Nigeria. Employing a mixed-method research design, they collected data from government platform analytics, structured questionnaires, and interviews with municipal officials. The observation period was 2021–2022, with a population of 1,500 registered platform users, and a sample size of 500, selected using stratified random sampling. Using Structural Equation Modeling (SEM), the analysis revealed that ease of navigation, clarity of budgeting tools, and responsiveness of online forms positively influenced participation rates. Over 70% of respondents indicated higher likelihood of engaging in e-budgeting when the platform was intuitive and mobile-optimized (Olaleye & Okon, 2023; Adeola et al., 2022).

Nguyen and Tran (2022) conducted an empirical assessment of the Vietnamese national e-budgeting portal's usability and its effect on civic participation. The quantitative survey-based study involved data from 2020–2022, targeting adult citizens across Hanoi and Ho Chi Minh City. The population included internet users aged 18–60, with a sample size of 750, derived via systematic sampling. Exploratory factor analysis (EFA) and multiple regression revealed that usability factors—such as design aesthetics, consistency, and real-time feedback features—significantly increased platform trust and voluntary engagement. The researchers concluded that participatory outcomes were directly tied to interface simplicity and language localization (Nguyen & Tran, 2022; Le & Bui, 2023).

3.   Methodology

This study adopts an exploratory, library-based research design, drawing on a comprehensive review of conceptual frameworks, theoretical perspectives, and empirical literature concerning digital tools and citizen participation in budgeting. The methodology emphasizes secondary data sources, including academic journals, policy reports, and institutional publications, to synthesize current knowledge and identify prevailing trends and gaps.

4.   Conclusions, Recommendations, and Suggestions for Further Studies

In conclusion, this study establishes that despite increasing efforts to promote citizen participation in budgeting through digital tools, significant disparities remain between intended outcomes and actual civic engagement—particularly in developing contexts such as Nigeria. Challenges such as limited digital literacy, poor system usability, inadequate user accessibility, and socio-political barriers continue to marginalize key demographics from participatory processes. While digital platforms have improved access to budget information, their ability to facilitate inclusive and impactful participation is constrained by design inefficiencies, infrastructural limitations, and tokenistic implementation strategies. The interplay of participatory democracy, technology adoption, and innovation diffusion remains complex and context-dependent, demanding multi-level interventions.

Based on the findings, this study recommends the development of context-sensitive, user-centered digital budgeting tools that prioritize accessibility for marginalized groups, including women, the elderly, and rural populations. Governments should integrate digital literacy training into civic education programs and ensure that participatory platforms are mobile-responsive, language-inclusive, and equipped with feedback mechanisms that link citizen input to policy outcomes. Furthermore, a legal framework should institutionalize citizen engagement in the budget cycle to shift participation from symbolic consultation to binding influence. Institutional actors must also invest in interoperable systems and inclusive interface design to bridge the digital divide and promote sustained participation.

For future research, empirical studies should explore the longitudinal effects of specific digital budgeting interventions on policy responsiveness, public trust, and equity in resource distribution. There is also a need to develop evaluative metrics for assessing the quality of citizen input and the extent of its integration into final fiscal decisions. Comparative studies across urban and rural settings, as well as gender- and age-disaggregated analyses, will provide deeper insights into participation dynamics. Finally, the role of emerging technologies—such as artificial intelligence, blockchain, and machine translation—in enhancing participatory budgeting platforms should be examined to inform adaptive, future-proof digital governance models.

References

Adedeji, A. O., & Adegbite, A. M. (2022). *Digital governance and participatory budgeting in Africa: A systematic review of empirical evidence*. Journal of African Public Administration, 18(2), 47–63. https://doi.org/10.1016/j.japa.2022.11.002

Adeola, F., Oyekanmi, A., & Usman, H. (2022). *Usability Challenges in Nigerian Public ICT Systems*. African Tech & Policy Review, 9(2), 123–141.

Agbo, P. C., & Ezeani, E. O. (2023). *Bridging the digital divide in Nigerian governance: Challenges and prospects*. International Journal of Governance and Development, 4(1), 93–107. https://doi.org/10.5281/zenodo.7653294

Ajayi, A. T., & Mbatha, B. N. (2022). Evaluating e-governance platforms using usability testing in West Africa. *African Journal of Information Systems, 14*(2), 73–90.

Ajayi, M. T., & Gyan, E. K. (2023). Evaluating the limitations of TAM in digital public governance. *African Journal of Digital Administration, 6*(1), 55–72.

Akinyemi, O. S., & Kwarteng, J. (2023). User-centered design for public service delivery systems. *Journal of Digital Governance, 6*(1), 112–129.

Alawode, K. O., & Ogunleye, B. R. (2022). *Civic engagement and the use of technology in Nigeria's budgetary processes*. African Journal of Public Policy, 6(3), 75–90. https://doi.org/10.1007/s12116-022-09412-9.

Alhassan, M. & Yeboah, K. (2022). *Inequalities in E-Participation: A Usability Analysis*. Journal of African Digital Studies, 6(3), 103–122.

Aliyu, M., & Sulaimon, T. A. (2022). *E-participation in Nigeria: Policy challenges and digital innovation*. Journal of Digital Public Administration, 7(2), 44–59. https://doi.org/10.1177/23998083221102463

Amadi, F. O., & Kure, G. (2023). *Citizen-centric budgeting and the promise of ICTs: Nigerian evidence in context*. Journal of African E-Government, 9(1), 22–38. https://doi.org/10.1080/20421338.2023.2052213.

Amoako, E., & Boateng, D. (2024). Uneven participation in Ghana's budgeting platforms. *West African Journal of ICT & Governance, 9*(1), 55–73.

Asare, J., Owusu, B., & Koomson, G. (2022). Digital readiness and fiscal participation in Sub-Saharan Africa. *African Technology and Society Journal, 7*(3), 88–106.

Ayinde, R., & Mba, C. (2023). Digital skills and budget participation in Nigeria: A citizen-centric perspective. *African Governance Review, 7*(1), 58–76.

Ayinde, O. T., & Musa, A. T. (2022). *An evaluation of public participation platforms in Nigeria's budgeting process*. Public Policy and Administration Review, 10(2), 58–73. https://doi.org/10.1016/j.pupar.2022.101132.

Ayoade, J., & Ojo, O. (2022). Digital mobilization for participatory governance in West Africa. *African e-Government Review, 5*(2), 45–61.

Ayodeji, T. S., & Osei, M. A. (2022). Patterns of civic tech diffusion in West Africa. *Journal of Digital Participation and Public Policy, 4*(1), 55–69.

Ayodele, M. K., & Mensah, E. O. (2022). Participatory democracy and digital fiscal tools in sub-Saharan Africa. *African Journal of Civic Innovation, 5*(2), 91–107.

Bala, T., Nwosu, K., & Aliyu, Z. (2022). Bridging the rural digital divide in Nigeria's fiscal governance. *African Public Sector Review, 8*(2), 121–138.

Bawa, Y. K., & Ogunleye, R. A. (2023). System design and citizen engagement: Insights from the Open Treasury Portal. *Nigerian Journal of Civic Technology, 4*(2), 60–79.

Bello, H. A., & Gyan, E. K. (2022). Tracking budget transparency through digital diffusion. *International Journal of E-Governance Research, 9*(3), 114–129.

Bello, H. K., & Chen, L. (2023). Interface design for inclusive access: Lessons from sub-Saharan civic tech. *Global ICT and Design Journal, 9*(3), 201–218.

Chima, E., & Nwoko, U. (2022). *Accessibility and Engagement in African Budget Portals*. Public Sector Technology Journal, 5(3), 134–152.

Chikwe, J., & Odili, F. (2023). Digital exclusion and budgeting participation in Northern Nigeria. *Journal of African e-Governance, 7*(1), 45–63.

De Santis, M., & Ricci, V. (2022). Techno-optimism versus digital literacy realities in EU governance. *European Journal of Public Policy, 29*(1), 110–128.

Dogo, M. B., & Lawal, K. O. (2022). *Participatory governance and the performance of budgeting platforms in Nigeria*. Journal of Politics and Administration, 5(4), 101–117. https://doi.org/10.1007/s10742-022-09477-8

EU Civic Tech Observatory. (2023). *Interface Design for Participatory Governance*. Brussels: EU Publications Office

Fernandez, L., & Blake, H. (2022). Empowering participation: Digital literacy and fiscal democracy in Spain. *European Journal of e-Governance, 6*(2), 90–105.

Ezugwu, C. A., & Edeh, C. O. (2023). *Digital inclusion and participatory budgeting: Evidence from Southeast Nigeria*. Journal of Information Society and Governance, 8(3), 124–139. https://doi.org/10.1093/jgovsoc/ijad004

Gambo, Y. A., & Ogbonna, C. N. (2022). *ICT tools and the future of democratic budgeting in sub-Saharan Africa*. Digital Public Administration Review, 11(1), 80–95. https://doi.org/10.1177/23998083221109682

Greenwood, R., & Sanders, M. (2022). Citizen fatigue in civic tech: A participatory budgeting perspective. *Journal of Urban Governance, 8*(2), 71–88.

Holtzman, D., & Greene, T. (2022). User engagement and fiscal transparency: A U.S. city-level analysis. *Civic Tech Policy Quarterly, 6*(1), 30–49.

Ibrahim, S. M., & Bello, H. S. (2022). *Challenges of digital participation in the Nigerian budgeting system: An institutional perspective*. Journal of Public Administration and Governance, 14(1), 77–94. https://doi.org/10.1111/jpaf.12456

Ishaku, T. A., & Okonjo, E. B. (2023). *Exploring citizen engagement in fiscal governance: The role of e-governance tools in Nigeria*. International Journal of Public Sector ICT, 5(2), 142–158. https://doi.org/10.1016/j.ijpsict.2023.100412.

Kariuki, M., & Njeru, G. (2022). From awareness to participation: Digital readiness and civic budgeting in East Africa. *African Policy Research Journal, 5*(3), 122–137.

Khan, M., & Rahman, S. (2024). *Redesigning Civic Tech for Inclusive Governance in Bangladesh*. South Asian Journal of e-Government, 8(1), 55–78.

Le, P., & Bui, T. (2023). *Localized Platforms and Public Finance Transparency*. Vietnamese Journal of Digital Governance, 7(2), 98–116.

Lee, H., & Park, J. (2022). *Usability Barriers in South Korea's e-Budgeting Platform*. Asian Journal of Public Administration, 7(3), 204–221.

Lewandowski, M., Zielinska, B., & Tomasz, W. (2022). Trust, tech, and budgeting: A municipal dilemma. *Central European Public Policy Review, 5*(2), 64–81.

Lombardi, A., Russo, F., & Leone, P. (2023). Digital barriers in Italian participatory budgeting. *Italian Journal of Public Innovation, 4*(2), 37–53.

Martínez, L., & López, R. (2024). *System Design Flaws in Catalonia's Budget Portals: A Citizen Perspective*. Iberian Digital Policy Journal, 4(1), 67–89.

Kim, Y., Shin, J., & Baek, D. (2023). *E-Participation and User Experience in Korean Fiscal Portals*. Governance & Innovation Studies, 9(1), 59–78.

Mendoza, C., & Ricci, M. (2022). Digital dashboards and participatory budgeting: Evidence from Spain. *European Journal of Civic Tech, 6*(4), 101–118.

Miller, A., Clarke, L., & Ng, S. (2022). The role of digital literacy in inclusive governance. *UK Public Sector Informatics Review, 8*(1), 101–120.

Mwangi, R., & Oketch, A. (2023). *System Usability and Budget Participation in East Africa*. East African Journal of Digital Governance, 5(1), 33–54.

Murphy, L., & Chan, W. (2022). E-governance and digital skills in American civic participation. *Journal of Civic Tech and Budgeting, 5*(1), 72–88.

Nabukeera, C., & Kamya, R. (2023). Digital civic platforms and participatory budgeting in Uganda: Disconnect or design flaw? *African Governance Studies, 6*(1), 25–44.

Nguyen, H., Bello, R., & Mathews, T. (2024). Global South digital budgeting: Accessibility without infrastructure? *Comparative Public Finance Studies, 8*(2), 55–77.

Nguyen, H., & Tran, L. (2022). *Digital Interface Design and Civic Participation in Vietnam*. Journal of Southeast Asian Governance, 4(3), 210–228.

Okafor, U. C., & Bamidele, J. K. (2022). *Digital budgeting innovations and grassroots inclusion: The Nigerian case*. Governance and Development Review, 13(4), 65–81. https://doi.org/10.1108/GDR-2022-1342.

Okeke, J. U., & Ayodeji, T. S. (2022). Digital competence and participation in budgeting platforms. *Journal of E-Participation Studies, 9*(1), 33–49.

Okeke, J. U., & Gyan, E. K. (2023). User behavior and technology acceptance in e-budgeting platforms. *Journal of Digital Governance, 7*(1), 64–82.

Okeke, T. C., & Alhassan, J. B. (2023). Mobile accessibility and civic tech adoption in Ghanaian budgeting. *Journal of African Civic Tech, 4*(2), 55–71.

Okonjo, C., & Bello, A. (2024). Participatory budgeting in Northern Nigeria: Engagement without influence. *Nigerian Journal of Budget Studies, 5*(2), 90–106.

Okonkwo, C. A., & Mensah, K. (2023). Adoption drivers of e-participation in budgeting in Nigeria. *Journal of Civic Technology Research, 10*(2), 102–121.

Okonkwo, E. J., & Mensah, A. (2022). Evaluating civic apps: A study of usability in public engagement platforms. *Journal of Digital Democracy, 7*(2), 121–136.

Olaleye, T., & Okon, A. (2023). *Interface Design and Public Participation in Lagos E-Budgeting*. Nigerian Journal of e-Governance, 11(1), 77–95.

Olamide, A., & Yusuf, K. (2022). Digital literacy and budgeting engagement: A Nigerian perspective. *Governance and ICT Review, 5*(1), 60–75.

Olaniyan, R. O., & Ogunyemi, B. M. (2023). Digital governance and public accountability in sub-Saharan Africa. *African Journal of ICT Development, 6*(2), 42–59.

Omotayo, S. A., Musa, F. A., & Ogunleye, K. B. (2023). Addressing localization in interface design: A framework for multilingual digital platforms in Nigeria. *African Journal of ICT Design, 6*(2), 58–75.

Oyekanmi, F. A., & Toure, Y. D. (2022). Social trust and perceived usefulness in budget transparency tools. *Journal of Digital Civic Innovation, 5*(2), 73–91.

Parrado, S., & Navarro, C. (2023). Digital divide and civic engagement in budgeting: Lessons from e-participation platforms. *Information Polity, 28*(1), 55–72.

Olatunji, F., Okeke, I., & Umar, S. (2022). *Citizen Feedback on Government Budget Platforms in Nigeria*. ICT and Governance Review, 8(1), 92–110.

Rajan, P., & Nyong'o, J. (2022). Inclusive budgeting through mobile innovation. *Journal of Public Finance and Digital Equity, 4*(2), 88–102.

Ramos, P., & Iglesias, V. (2023). Bridging the digital divide in budget participation. *Journal of Civic Technology, 5*(1), 33–49.

Roberts, K. A., Chen, Y., & Iversen, M. (2023). Rethinking usability in civic tech. *Civic Inclusion Review, 6*(1), 33–51.

Shaw, R., Becker, A., & Lin, J. (2023). Digital inequity and participatory platforms in the U.S. *Digital Inclusion Research Review, 6*(2), 101–119.

Smith, R., Taylor, J., & Ahmed, Z. (2023). *Usability and Citizen Budgeting Engagement in UK Cities*. Journal of Digital Public Administration, 6(1), 65–83.

Taiwo, A. O., & Hassan, M. L. (2022). *Bridging fiscal governance gaps with technology: Evidence from participatory budgeting platforms in West Africa*. African Journal of ICT and Society, 8(1), 33–49. https://doi.org/10.1177/26313312221107234

Taylor, M., & Brooks, A. (2023). Gamification and trust in civic budgeting platforms in the U.S. *Journal of Digital Governance, 8*(2), 66–81.

Thomas, K., & Riley, D. (2023). Why engagement fails: Digital overload in U.S. local budgeting. *Public Administration Review, 83*(4), 112–128.

Transparency International. (2023). *Civic tech and participation in fiscal governance*. TI Annual Report.

Transparency International. (2024). *Digital engagement and anti-corruption: Global barometer 2024*. Berlin: TI Publications.

Turyasingura, D., Ainebyoona, S., & Kwesiga, J. (2022). Digital inclusion and budgetary governance in East Africa. *Journal of Public Sector Innovation, 4*(3), 58–75.

Umar, M. A., & Bello, R. S. (2022). Understanding the role of observability in e-budgeting platforms. *Journal of E-Governance Strategy, 5*(1), 56–73.

UN E-Governance Index. (2023). *Africa's Digital Participation: Progress and Pitfalls*. UNDESA Report.

UNDP. (2022). *Civic tech and budget accountability in low-income countries*. New York: UNDP.

UNDP (2023). *Human-Centered Design in Digital Civic Platforms: Lessons from Asia*. United Nations Development Programme Report.

Usman, Z. A., & Ayoola, F. O. (2023). *Barriers to digital participation in budgetary decision-making: A mixed-methods study in Nigeria*. Public Administration and Development, 42(2), 104–119. https://doi.org/10.1111/padm.12378

Vidal, A., Martinez, P., & Bosch, F. (2023). Public participation metrics in local government budgeting. *Governance Data Review, 3*(3), 59–73.

Walker, T., & Jennings, S. (2023). Digital competency and budgetary engagement in UK local authorities. *Journal of Digital Democracy, 3*(4), 75–93.

Wambua, J., & Ochieng, B. (2024). Digital literacy and grassroots budgeting in Kenya. *International Journal of Local Governance, 4*(2), 44–63.

Watson, R., & Perez, M. (2022). Accessibility or exclusion? A longitudinal analysis of NYC's participatory budget portal. *Urban Digital Governance Journal, 7*(3), 44–61.

Wu, J., Chang, L. H., & Mei, C. T. (2022). Aging and digital inclusion in budgeting tools. *Pacific E-Governance Journal, 3*(4), 77–93.

Yahaya, S. A., & Oladimeji, T. F. (2022). *Technology-enabled public engagement and transparency in budget systems: Lessons from Lagos e-budgeting.* Journal of African Political Economy, 7(2), 89–105. https://doi.org/10.1080/20421338.2022.2150912

Yusuf, T., & Agbo, E. (2023). The pitfalls of digital engagement in local governance. *Africa e-Government Review, 6*(1), 39–53.

Yusuf, T., Ibrahim, M., & Adedayo, F. (2022). Digital literacy as a tool for participatory fiscal governance in Sub-Saharan Africa. *Public Finance Quarterly, 44*(3), 219–238.

Zawadzki, K., & Kowalska, J. (2023). Digital engagement and participatory budgeting: Lessons from Poland. *European Journal of Fiscal Participation, 7*(3), 115–132.

Zhou, Q., Okafor, A., & Singh, R. (2024). Civic tech and participatory budgeting in the Global South. *International Journal of Fiscal Democracy, 9*(1), 22–45.