Determinants of the digital divide in delivering inclusive education in public schools

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Abstract

The digital divide continues to expose entrenched disparities in access to quality learning, even as digital technologies become integral to modern education systems. This study investigates the key determinants of the digital divide and their implications for delivering inclusive education in public schools. Grounded in Diffusion of Innovations Theory and Digital Leadership Theory, the research employs a qualitative methodology through a systematic literature review of peer-reviewed articles, and empirical research, and policy documents. The findings highlight ICT skills, digital leadership, and ICT infrastructure as critical enablers or barriers to digital inclusion. Deficiencies in digital competencies among teachers and learners, limited infrastructure, and insufficient digital leadership exacerbate exclusion—especially in marginalized, rural, and low-income contexts. The study emphasizes that digital leadership is central to promoting equitable education by fostering teacher professional development, strategic resource allocation, and inclusive pedagogical practices. Furthermore, the presence of robust ICT infrastructure—including stable electricity, reliable internet, and adequate digital devices—is essential for meaningful digital participation. The research advocates for integrated, context-sensitive interventions that prioritize not only access, but also digital fluency, affordability, and the deployment of adaptive technologies for learners with diverse needs. It concludes by calling for cross-sector collaboration and long-term policy reforms to embed digital equity within the broader goals of inclusive education.

Key words

Digital divide, inclusive education, public schools

1.2 Introduction

Inclusive education refers to the effort to provide equitable access to quality education for all learners, regardless of their backgrounds or abilities. According to UNESCO (2020), it involves increasing participation in learning and reducing exclusion by embedding inclusive principles throughout the education system. The European Agency for Special Needs and Inclusive Education (2022) expands this concept to inclusive digital education, which requires systemic transformation through universal design, assistive technologies, and teacher preparedness to create equitable digital

learning environments. Measurements of inclusive education span various dimensions, including access indicators (such as internet and device availability), participation indicators (like engagement and interaction), learning outcomes (e.g., academic and socio-emotional development), readiness of teachers and institutions (including digital pedagogy), and policy-level metrics (such as inclusive national policies and funding equity) (McCarthy et al., 2023)

The digital divide poses a significant challenge to inclusive education, particularly in environments aiming to promote equity across socioeconomic backgrounds, geographic regions, and varying abilitie. The digital divide is shaped by interconnected social, economic, infrastructural, and technological factors that result in unequal access to and use of digital tools. Kelly and Rutazihana (2024) identify income, education, geographic location, age, and infrastructure (such as electricity and internet) as key determinants, noting their significant impact on educational access in Sub-Saharan Africa. Deng and El Hag (2024) distinguish between first-level divides (lack of devices and internet) and second-level divides (digital skills and usage), particularly affecting underserved students. Constancio (2024) adds that in Sub-Saharan Africa, historical infrastructural weaknesses and social disparities further entrench digital exclusion. Collectively, these studies reveal that the digital divide is a complex, multidimensional phenomenon requiring targeted and context-sensitive interventions.

In achieving inclusive education, addressing the digital divide requires a strong focus on the development and availability of ICT skills among both learners and educators. ICT skills defined as the ability to access, manage, evaluate, and communicate information through digital technologies are essential for effective participation in digital learning environments (Liu, 2021). Studies emphasize that mere access to devices is inadequate without the competencies to use them meaningfully (Deng & El Hag, 2024). This gap is particularly pronounced in inclusive settings, where learners with disabilities often encounter inaccessible platforms and a lack of assistive technologies (AlSadrani et al., 2020). Additionally, Constancio (2024) highlights that ICT skills must be contextualized within local socio-economic and infrastructural realities, especially in Sub-Saharan Africa. As Kelly and Rutazihana (2024) note, bridging this skills gap is critical for advancing digital inclusion and ensuring equitable learning outcomes.

The role of digital leadership and institutional readiness is critical in determining digital inclusion outcomes,

especially within educational institutions. Digital leadership is broadly defined as the strategic use of digital tools and platforms by school leaders to drive organizational improvement, enhance teaching and learning, and ensure equitable access to education (Liu, (Hamburg & Lütgen, 2019). Institutions with visionary digital leaders, well-articulated ICT integration strategies, and ongoing professional development programs for staff are more capable of equitably deploying technology to support diverse learners (Asante, 2025). For example, Liu (2021) emphasizes that strong digital leadership was pivotal in adapting to remote learning during the COVID-19 pandemic, allowing schools to address emergent disparities.

ICT infrastructure refers to the foundational physical and digital systems required to support information and communication technologies, including internet connectivity, computer hardware, software, data networks, and stable power supply (OECD, 2023; Liu, 2021). Infrastructural gaps manifest in the form of inadequate broadband coverage, high internet costs, insufficient access to functional digital devices, and unreliable electricity—conditions that are particularly acute in rural and underserved communities (Asante, 2025). The situation is further complicated by the absence of supportive digital ecosystems such as maintenance services, digital content in local languages, and institutional policies for sustained ICT deployment (Dagunduro et al., 2024). These infrastructural disparities directly affect students' ability to meaningfully engage in digital learning environments, reinforcing existing educational inequities and limiting the potential of inclusive education initiatives.

The digital divide is a global concern shaped by shared structural issues—ranging from infrastructural limitations and socio-economic inequality to digital illiteracy and institutional inertia. In the U.S., access and skills gaps persist among underserved learners (Deng & El Hag, 2024), while Saudi Arabia grapples with platform inaccessibility for students with disabilities (AlSadrani et al., 2020). Despite China's tech advances, rural–urban and socio-cultural disparities endure (Zhao et al., 2022). In Europe, digital inclusion hinges on leadership and institutional readiness, notably in Germany (Joseph & Uzondu, 2024;). Globally, disabled and marginalized populations remain disproportionately excluded from digital opportunities (Weber et al., 2022). In Sub-Saharan Africa, exclusion is intensified by poor broadband infrastructure, high costs, unreliable electricity, and a lack of local-language content and technical ecosystems (Hamburg & Lütgen, 2019; OECD, 2023; Liu, 2021; Dagunduro et al.,). Kenya reflects these broader trends, with regional inequities, limited ICT capacity among

educators, and insufficient assistive technologies still posing persistent barriers (OECD, 2023;).

Digital divides in public schools globally stem from intertwined infrastructural, socio-economic, and institutional inequalities that obstruct equitable digital education. In Sub-Saharan Africa and parts of Asia, schools grapple with unreliable electricity, limited internet access, and insufficient digital devices (Liu, 2021). These challenges are compounded in countries like Kenya and Ghana by weak policy enforcement and inadequate teacher training (Dagunduro et al., 2024). In the U.S., underserved students face both access-related and digital skills-based barriers (Deng & El Hag, 2024), while in Saudi Arabia, learners with disabilities are sidelined due to the lack of accessible platforms and assistive technology (AlSadrani et al., 2020). Meanwhile, Germany exemplifies how institutional readiness and strong leadership can promote digital equity, though gaps still exist (Weber et al., 2022). Bridging these divides calls for context-sensitive strategies involving infrastructure upgrades, inclusive digital policies, and sustained digital capacity-building efforts.

This study seeks to evaluate the key determinants of the digital divide and their influence on delivering inclusive education. Specifically, it aims to examine the influence of ICT skills, investigate the role of digital leadership in fostering equity, and assess the impact of ICT infrastructure in promoting an inclusive and equitable learning environment. By addressing these objectives, the research aims to provide actionable insights for policymakers, educators, and stakeholders seeking to enhance inclusive and equitable education through targeted digital inclusion strategies

1.3 Statement of problem

Addressing the digital divide in inclusive education requires ensuring that all learners, regardless of socioeconomic status, location, or ability, have equitable access to digital technologies, affordable internet, and the skills necessary to use them effectively (Dastyari & Jose, 2024; Liu et al., 2024). This includes not only providing devices and connectivity but also fostering digital literacy, critical thinking, and meaningful participation in digital environments (Liu et al., 2024; Achieving this vision depends on strong leadership, supportive policies, and investment in infrastructure that bridges school and home digital environments, particularly for marginalized populations (McCarthy et al., 2023; UN-Habitat, 2021). Digital inclusion must be people-centered, context-specific, and grounded in principles of equity and social justice to fulfill the goals of inclusive and equitable quality education for all (Dastyari & Jose, 2024; Ehimuan et al., 2024).

The digital divide in delivering inclusive education is marked by persistent inequalities in access, skills, and participation. Many learners, especially those from low-income families or rural areas, lack physical access to digital devices and reliable internet connectivity, which hinders their ability to engage in digital learning (Zhang, 2024). Beyond access, disparities in digital literacy further deepen exclusion, as students without sufficient training struggle to utilize available technologies effectively (UNDP, 2024). The divide is also shaped by intersectional inequalities, including age, gender, race, and disability, with marginalized groups disproportionately affected (European Agency for Special Needs and Inclusive Education, 2024). Furthermore, trust deficits in public digital systems and a lack of coordinated digital leadership undermine inclusive implementation (Ming & Mansor, 2024). Without a comprehensive, people-centered, and equity-driven approach, the digital divide will continue to obstruct the goal of inclusive education for all (UNDP, 2024).

Ideally, digital inclusion ensures that all learners have equitable, affordable, and meaningful access to digital tools, internet connectivity, and the skills needed to thrive in digital learning environments—supported by strong leadership, inclusive policies, and infrastructure that bridges school and home settings (Dastyari & Jose, 2024; Liu et al., 2024). In contrast, the current landscape is marred by persistent inequalities, where access is uneven across socio-economic, geographic, and demographic lines; digital literacy is lacking among both learners and educators; and many systems remain ill-prepared to support inclusive, technology-enabled education (Zhang, 2024; UNDP, 2024). Moreover, while the ideal scenario calls for trust in digital systems and coordinated leadership, the reality includes skepticism toward digital governance and fragmented efforts, particularly in underserved regions (Ming & Mansor, 2024).

This study seeks to examine the key determinants contributing to the digital divide by exploring the influence of ICT skills, evaluating the role of digital leadership in promoting equity, and assessing how ICT infrastructure supports the creation of an inclusive and equitable learning environment. In doing so, the study aims to propose context-responsive solutions that promote digital inclusion—such as enhancing digital literacy for both learners and educators, strengthening leadership capacity to drive equitable digital policies, and improving ICT infrastructure to ensure universal, affordable access.

1.4 Research objectives

The primary aim of this study is to assess the determinants of the digital divide in

delivering inclusive and equitable quality education.

Specific Objectives:

a. To evaluate the influence of ICT skills on delivering inclusive education in public schools.
b. To investigate the influence of digital leadership in promoting inclusive education in public schools.
c. To assess the influence of ICT infrastructure in fostering inclusive education in public schools

1.5 Research questions

This study seeks to address the following key questions:

a. What is the influence of ICT skills on the delivery of inclusive education in public schools?
b. In what ways does digital leadership contribute to promoting inclusive education in public schools?
c. How does ICT infrastructure affect the creation of an inclusive learning environment?

1.6 Theoretical background

In contemporary organizational dynamics, one pivotal theory stands out for its transformative impact: Diffusion of Innovations (DOI) Theory. This theory can help education institutions to addressing the digital divide by developing strategies that promote inclusive education.

Diffusion of Innovations Theory (DOI)

Innovation Diffusion Theory (IDT), proposed by Everett M. Rogers in 1962, explains how new ideas, practices, or technologies spread within a social system over time (Rogers, 2003). The theory assumes that the adoption of innovations follows a sequential pattern involving five adopter categories: innovators, early adopters, early majority, late majority, and laggards (Rogers, 2003). Adoption decisions are influenced by five key attributes of the innovation—relative advantage, compatibility, complexity, trialability, and observability (Davis & Thilagaraj, 2022). Additionally, the theory posits that communication channels, social systems, and the time dimension significantly affect how innovations diffuse (Meng, 2022). It also highlights the role of opinion leaders and the social network in shaping adoption behavior, categorizing decisions as optional, collective, or authority-based (Eaton et al., 2024).

However, IDT has limitations. It often assumes a linear and top-down approach to adoption, overlooking the possibility of resistance or rejection (Eaton et al., 2024). The theory also struggles to predict innovation uptake in rapidly changing or complex environments, such as those

found in digital education systems (Davis & Thilagaraj, 2022). Furthermore, it tends to neglect the influence of local context and cultural factors, especially in less developed or marginalized settings (Meng, 2022). Finally, IDT often assumes that innovations are inherently beneficial, minimizing critical concerns related to equity, access, and systemic barriers (Eaton et al., 2024).

Innovation Diffusion Theory (IDT) helps explain why digital technologies are adopted unevenly in public schools by categorizing users into groups like innovators and laggards based on their readiness and access to resources (Rogers, 2003). It highlights factors such as perceived usefulness, compatibility, and complexity as key influences on adoption decisions (Davis & Thilagaraj, 2022). The theory also emphasizes the role of leadership and peer networks in shaping adoption behaviors (Meng, 2022). However, IDT must be adapted to include broader structural issues like poverty and infrastructure gaps, which are crucial in understanding the digital divide in education (Eaton et al., 2024).

1.9 Methodology

This study adopts a qualitative research design, employing a systematic and integrative literature review to explore the determinants of the digital divide and their implications for delivering inclusive education in public schools. A qualitative approach is particularly suitable for this inquiry as it allows for a nuanced and contextual understanding of complex, interrelated factors such as ICT skills, digital leadership, and infrastructure disparities, which influence equitable access to digital learning opportunities (Asante, 2025). The methodological framework is grounded in an in-depth content analysis of peer-reviewed scholarly articles, empirical studies, and theoretical contributions published between 2020 and 2025.

To ensure a comprehensive and credible evidence base, literature was retrieved from reputable academic databases including Google Scholar, JSTOR, Scopus, ScienceDirect, and ResearchGate, using advanced search filters and Boolean operators to refine search results. Key search terms included combinations of "digital divide," "ICT skills," "digital leadership," "ICT infrastructure," and "inclusive education." The review prioritized studies with clear relevance to the education sector, particularly those addressing digital equity and access in public school settings. This allowed the study to synthesize findings around core thematic areas: the influence of ICT competence among educators and learners, the role of digital leadership in fostering equitable practices, and the availability and reliability of technological infrastructure in shaping digital inclusion outcomes.

2.0 LITERATURE REVIEW

Digital divide has been taunted as one cause of lack of inclusivity and equitability in quest for quality education. Technology and connectivity is very critical in ensuring that every learners has access to relevant tools and platforms to support the inclusion of diverse student groups in education. To unlock the full potential of technology in promoting inclusive and equitable education, the study aimed to explore key factors contributing to the digital divide—namely ICT skills, digital leadership, and ICT infrastructure—and assess their impact on the implementation of inclusive education initiatives.

2.1 ICT skills

Research studies emphasize the pivotal role of ICT skills in bridging educational inequalities and enhancing learning outcomes. Waqar et al. (2024) critically examine how unequal access to digital tools and low digital literacy levels in rural Pakistan hinder inclusive education. The paper highlights the urgent need to build ICT competencies among both students and teachers to close the urban-rural education gap. Singh et al. (2022) emphasize that the successful adoption of e-learning as a solution to the digital divide requires not only infrastructure but also significant investment in ICT training for educators. Their empirical study shows that teachers' digital competence directly influences the effectiveness of e-learning platforms. Haleem et al. (2022) provide a comprehensive review of digital technologies in education, outlining how digital literacy, the use of learning management systems (LMS), and familiarity with tools like virtual labs and content creation software are essential ICT skills for modern teaching and learning. Together, these studies underline the necessity of integrating ICT skill development into teacher training and curriculum design to ensure equitable and effective digital education. Although the present era is mainly depending on online, most of the students do not have adequate knowledge and skills necessary to exploit those resources for e-learning (Ngozi, Onoimiuko, & Eneh, 2020).

Similarly, Zhao et al. (2022) found that rural students in China faced a significant digital outcome divide, largely due to low digital self-efficacy. ICT skills were directly linked to learner engagement and academic success in online learning contexts. Moreover, Hamburg and Lütgen (2019) emphasize that ICT skills are integral to digital inclusion and inclusive education, particularly for students with special needs. These skills empower learners to access assistive technologies and participate fully in classroom activities. Zhang (2024) highlights how limited digital literacy among

marginalized communities perpetuates educational inequalities. He further notes that many educational leaders lack the training necessary to manage digital tools effectively, which can hinder the success of digital initiatives.

2.2 Digital leadership

Digital technologies have emerged as essential tools in education, bridging gaps in access and providing equitable opportunities for learners. E-learning, for instance, can reduce the barriers posed by location and socio-economic status, offering students access to high-quality education regardless of their physical environment. However, the successful integration of these technologies into education systems requires a thoughtful strategy, encompassing infrastructure, digital literacy, and training for both students and educators (Singh, S., & Nermend, M., 2022) Dastyari and Jose (2024) maintain that digital inclusion is essential for achieving Sustainable Development Goal 4 (SDG4), ensuring that all students have meaningful access to technology regardless of socio-economic background. This is reinforced by the Gottschalk & Weise (2023), who highlights that digital leader must work towards reducing infrastructure disparities, particularly in rural and underserved areas.

Digital leadership plays a crucial role in equipping educators with the skills to integrate technology into teaching, as effective digital competencies are essential for overcoming disparities in digital access and ensuring inclusive educational outcomes (Kelly & Rutazihana, 2024). Research by Bagacina et al. (2024) underscores the importance of investing in educators' digital competencies to ensure effective teaching in digital environments. Without this investment, disparities in digital literacy among teachers can contribute to uneven educational outcomes. Furthermore, Aldoseri et al. (2023) emphasize that successful digital transformation requires a clear strategy for incorporating technology into the curriculum and assessment practices. School leaders play a pivotal role in fostering an inclusive digital culture.

2.3 ICT infrastructure

ICT infrastructure is a critical determinant of the digital divide and plays a foundational role in achieving inclusive education (Kelly & Rutazihana, 2024). It encompasses access to reliable internet connectivity, digital devices (such as computers, tablets, and servers), electricity, and supportive learning platforms. The adequacy of this infrastructure directly influences the ability of learners and teachers to participate meaningfully in digital education (Zhao et al., 2021). Disparities in ICT infrastructure contribute

significantly to the persistence of the digital divide.

For instance, Liu (2021) reports that during the COVID-19 pandemic, learners in low-income and rural communities were disproportionately affected due to limited internet access and the absence of digital devices at home. This infrastructural gap curtailed their ability to engage in online learning, leading to interrupted education and widened learning inequalities. Zhao et al. (2022) found that in China, rural students were less likely to benefit from e-learning due to poor infrastructural support, such as unstable internet connections and a lack of digital tools. These deficiencies not only hindered engagement but also diminished academic outcomes, illustrating how ICT infrastructure is intertwined with educational equity.

In Pakistan, Waqar et al. (2024) observed similar trends where inadequate ICT infrastructure in rural schools—including unreliable power supply and outdated equipment—acted as barriers to delivering inclusive education. Without the necessary infrastructure, efforts to close learning gaps between urban and rural students remain ineffective. Constancio (2024) highlights that in sub-Saharan Africa, systemic infrastructural deficits—rooted in socio-economic and historical inequalities—continue to limit digital access and participation in education. He advocates for context-specific strategies and investments to ensure that infrastructure supports localized and inclusive digital learning models. Haleem et al. (2022) reinforce that robust ICT infrastructure enables more than just access; it enhances pedagogical innovation, supports differentiated learning, and empowers learners through technology-driven interaction and collaboration.

3.0 RESULTS/FINDINGS

This study sought to explore the determinants of the digital divide and their influence on the delivery of inclusive education. It found that the digital divide is a complex, multidimensional issue that goes beyond mere access to devices and internet connectivity. UN-Habitat (2020) emphasizes factors such as urban-rural disparities, infrastructure deficits, affordability, demographic gaps, and digital literacy. The study identified key determinants including socioeconomic status, educational background, and digital literacy (Zhang, 2023; Arevin et al., 2024), geographic location (UN-Habitat, 2021; UNDP, 2024), and demographic factors like age and gender (Ehimuan et al., 2024; Zhang, 2023), all of which significantly influence equitable access to and effective use of digital resources in education.

3.1 ICT skills

The digital divide continues to pose significant challenges to society, particularly within the field of education. It serves as a major barrier to educational equity, as some teachers lack essential technology-based competencies, while many students are deprived of access to online resources and digital tools (Zhang, 2023). These competencies include operational skills, effective information management, and the capacity for strategic decision-making (Deng & Hag, 2024). From a sociological perspective, digital learning extends beyond mere access to devices it also encompasses the ability to use technology proficiently. This is where digital literacy becomes crucial, involving the ability to navigate, evaluate, and produce information through digital means (Chikwe et al., 2024). Poor skills of teachers and students in the educational institutions on use of e-learning facilities may also hamper their access to online resource at this critical Covid 19 era (Ngozi, Onoimiuko, & Eneh, 2020). As Chikwe and colleagues point out, students without access to technology or adequate digital literacy are placed at a considerable disadvantage when compared to their more digitally equipped peers. To avert a digital-skills gap and promote equal technology usage in inclusive classrooms, students must acquire core skills and learn to use ICT tools effectively to enhance their own learning (AlSadrani et al., 2020).

3.2 Digital leadership

Digital leadership plays a pivotal role in fostering inclusivity and ensuring equitable quality education. A critical role is to close the digital divide by providing all students with equal access to digital tools and resources, irrespective of socioeconomic or geographic challenges (Dastyari & Jose, 2024). Through strategic policies, school leaders can ensure that marginalized groups, including low-income, disabled, and remote learners, receive the necessary digital infrastructure and support (Gottschalk & Weise, 2023). According to the European Agency for Special Needs and Inclusive Education (2024), digital leaders must prioritize teacher training, curriculum adaptation, and inclusive pedagogical strategies to ensure that digital tools enhance learning outcomes equitably. Gottschalk and Weise (2023) emphasize that digital leaders must implement policies that ensure equal access to educational technology, particularly for students from disadvantaged backgrounds. Ming and Mansor (2024) emphasize the importance of integrating transformational and distributed leadership models in digital leadership to address the complexities of digital transformation, ensuring active participation from students, teachers, and policymakers in digital inclusion efforts.

3.3 ICT Infrastructure

Research highlights the pivotal role of ICT infrastructure investment in expanding educational access, particularly in rural regions. Such investments can enhance the availability of learning resources. Supporting this claim, Waqar et al. (2024), in their study conducted in Pakistan, observed that urban educational institutions are more equipped with computer labs, internet-enabled classrooms, and advanced technological learning tools. This underscores a clear disparity in infrastructure, which affects the integration of technology in teaching and learning. Several contributing factors have been identified, including the high cost of digital devices, limited knowledge on their effective use, and inadequate infrastructure to support such integration (Singh, & Nermend, 2022). The absence of ICT devices, infrastructural gaps, and poor connectivity continues to restrict learning opportunities, especially in developing countries where these challenges are more acute (Liu, 2021; Kelly & Rutazihana, 2024).

CONCLUSION AND RECOMMENDATIONS

This study comprehensively examined the determinants of the digital divide—ICT skills, digital leadership, and ICT infrastructure—and their collective influence on delivering inclusive education in public schools. The findings reveal that the digital divide extends beyond physical access to encompass disparities in digital literacy, institutional capacity, and infrastructural equity. The study underscores the need for coordinated, long-term strategies to ensure that technological advancements in education do not reinforce, but rather reduce existing inequalities.

ICT skills remain foundational for inclusive learning, yet gaps in digital competencies among educators and learners persist, particularly in underserved regions. The study recommends Integration of ICT skill development into teacher training and school curricula to build foundational competencies for digital teaching and learning. (Haleem et al., 2022). Singh et al. (2022) argue that the ICT skills gap can be mitigated by implementation of continuous professional development (CPD) programs for educators on digital tools, content creation, and adaptive technologies to enhance classroom inclusion. Promoting student digital fluency through age-appropriate ICT modules and learning management systems that facilitate both access and navigation is critical in addressing the digital competencies (Bagacina et al., 2024). Chikwe et al. (2024) proposes collaborate approach with stakeholders to develop community-based ICT training initiatives for marginalized learners and

parents to reduce intergenerational digital illiteracy.

Central to this evolution is the role of digital leadership, which drives the adoption of technology, formulates inclusive strategies, and provides frameworks to ensure equitable access for all students. The effect of digital leadership in delivering inclusive education can be enhanced by embeding digital leadership competencies into educational management training programs to equip school leaders with skills in digital policy formulation, strategy implementation, and inclusive design. (Liu, 2021) (Gottschalk & Weise, 2023). School leaders can adopt distributed and transformational leadership models that promote collective participation of teachers, learners, and parents in digital inclusion efforts. (Zhang, 2024) (Ming & Mansor, 2024). Dastyari & Jose (2024) advocate for development institutional digital inclusion strategies that focus on inclusive pedagogy, ICT-based assessment practices, and support for learners with disabilities.

Moreover, ICT infrastructure proves to be a prerequisite for digital inclusion, with uneven access to devices, connectivity, and electricity compounding educational disparities. The study recommends the governments to prioritize equitable investment in ICT infrastructure, especially in rural and marginalized areas, including internet connectivity, electricity access, and device provision. (Waqar et al., 2024) Establishing public-private partnerships to support long-term digital infrastructure projects and ensure sustainable maintenance and upgrades is key to tackling the ICT infrastructure gap (Constancio, 2024). Kelly & Rutazihana (2024) proposes development of scalable models of low-tech and offline-compatible solutions, such as solar-powered devices and downloadable content, for learners with inconsistent connectivity.

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