

Systematic Review: Challenges Exacerbating Digital Inequality Among Individuals In Rural Areas

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Abstract: ICT has become a crucial tool for driving socio-economic development across various sectors in Kenya. It has the potential to significantly contribute to the economic growth and social progress of communities. However, rural areas face obstacles that hinder the advancement and realization of the impact of ICTs. These challenges encompass issues such as illiteracy, high ICT costs, lack of awareness, limited local content, and inadequate infrastructure. This study systematically reviewed the ICT challenges that worsen digital inequality among rural individuals, applying Preferred Reporting Items for Systematic reviews, and Meta-Analyses (PRISMA). It resulted in generation of four critical themes; sustainability, technical support, rural ICT attributes, and user concerns with their corresponding codes from the data. The findings revealed that illiteracy and poverty are significant user concerns. This paper concludes that, given the identified challenges, it is crucial to establish enduring initiatives for rural areas, particularly, considering the vulnerable in the society, including the poor and illiterate allowing them to reap the benefits of ICT just like their well able and literate counterparts.

Keywords: challenges, ICTs, rural areas, systematic review, Kenya, digital inequality

I. INTRODUCTION

Digital inequality is a major challenge that the world is grappling with, and there are serious concerns surrounding it (Heeks, 2022). Emerging from variations in real technology access and disparities in digital literacy, digital inequalities can be understood as the extent to which individuals possess the skills, knowledge, motivation, and competence to access, process, engage, and comprehend the information necessary to derive benefits from digital technologies, including computers, the Internet, mobile devices, and applications (Beaunoyer, Dupere, & Guitton, 2020). These variances in access and digital literacy are firmly rooted in social, economic, cultural, and global environments. The primary perspective for comprehending the connection between digital technology and inequality has so far centered on the concept of the digital divide (Heeks, 2022). This pertains to digital divide between

nations, regions, groups, and individuals who are either absolutely or relatively deprived of the advantages offered by digital technology (van Dijk, 2020). Hence, this paper uses digital inequality and digital divide synonymously.

Despite two decades have passed, there are still significant access disparities that divide those who have access to digital resources and those who do not, both within and between countries. Furthermore, even in populations where access is widespread, there are differences in skills and how digital resources are utilized. In fact, longstanding digital disparities persist in relation to economic status, gender, race and ethnicity, age, disability, healthcare, education, rural living, networks, and global locations (Robinson, et al., 2020).

The potential for advancements in digital technology to primarily benefit those who are already connected while widening inequality within and between countries needs to be tackled through impactful policies that aim to ensure that no

one is left behind. The COVID-19 pandemic has worsened existing digital disparities and technological inequality (Van Dijk, 2020). Furthermore, simply promoting access does not automatically ensure a decrease in inequalities. The expansion of digital technologies without inclusive policies and governance can actually exacerbate inequalities, as evidenced by the disparity between rural and urban areas within countries. This can also lead to limited social mobility and unequal development, which affects numerous marginalized and excluded groups (UN, 2022). Therefore, when distributed evenly and with good design, internet access and new technologies have the potential to propel future growth. They can also redefine social protection systems to make societies more inclusive, offer new opportunities to young and marginalized individuals, and improve the quality of life for those with access to them (UN, 2022).

Thus, the objective of this paper is to understand the challenges exacerbating digital inequality among individuals in rural areas, particularly in Kenya. This work is part of a survey aimed to develop a solution to the design of rural ICTs for inclusivity. To achieve this, systematic review methodology was applied.

II. SYSTEMATIC REVIEW

A systematic review is basically a method for pulling together all the available evidence in a detailed, unbiased, and clear way (Ribeiro-Fernandes, 2022). The primary objective is to offer an all-encompassing synopsis of all the primary investigations associated with a particular query. This type of review uses all the existing research, often called secondary research (Clarke, 2011). Many fields, including Information Systems (IS) studies, have adapted these systematic review methods, originally designed for clinical research, to suit their needs (Ribeiro-Fernandes, 2022). Using systematic reviews to gather evidence from previous studies reduces the need to rely solely on new surveys, helping to avoid repeating work that has already been done (Ribeiro-Fernandes, 2022) like in the case, Kenya's rural ICT studies.

This study used a systematic review to understand the challenges faced by different demographics while accessing and using rural ICTs. The choice of the methodology was based on the need for a rigorous and efficient approach that could exhaustively examine the premise.

A. OVERVIEW OF RURAL ICT INTERVENTIONS

The Kenyan government implemented rural digital interventions to connect individuals in rural areas with their peers and online services. The aim of this initiative was to create equitable access to ICTs hence bridging the digital divide between urban and rural areas, also accelerating the achievement of Vision 2030. In addition to addressing the digital divide, the initiative sought to provide ICT training to rural communities.

The government anticipated that the RICT initiative would enhance business skills and knowledge, expose rural communities to global news and trends, and improve their quality of life. The initiative was expected to generate direct

employment through the economic activities of the ICT centers and indirectly through the economic opportunities created by the information accessed. Furthermore, it aimed to bring government services and other online information closer to rural communities. Beyond access to email, social media, and online information, operators were encouraged to offer additional services such as photocopying, document printing and binding, digital photography, video editing, stationery sales, and mobile phone airtime.

The government believed that with suitable and sustainable implementation models, rural ICT Centres could effectively meet individual information needs and reduce inequalities. This rural ICT initiative was part of the digital inclusion strategy, assisting entrepreneurs in setting up digital village centers, known as Pasha Centres, across the country. The Digital Village ecosystem included various players such as CBOs, NGOs, Telcos, churches, cooperatives, development partners, and cyber-café's, with Pasha Centres being a key subset. Pasha Centres operated under a Public-Private Partnership (PPP) model which differentiated it from other rural ICT initiatives. The Kenya Information, Communication and Technology Board (KICTB) funded three categories of centres—Basic, Standard, and Advanced—based on the manager's eligibility, using a US\$ 4 million World Bank grant.

Therefore, applying systematic review methodology, this paper uses Kenyan rural ICT studies (digital village/pasha centres) to understand various challenges in its access and use.

B. OBJECTIVES OF THE REVIEW

By putting together and analyzing the existing research, this study intended to discover the underlying causes of the digital divide among various demographics in rural areas. According to Gillespie (2021), meta-analysis is significant and could be used to develop hypotheses. Aside from generating hypotheses or research questions, it also assists in understanding major areas of the digital divide that need to be addressed. This approach was critical in pinpointing critical concerns that need to be addressed so as to enhance digital inclusivity.

C. STUDY DESIGN

Numerous researchers advocate for systematic reviews due to their capacity to deliver timely and reliable evidence for policymakers and practitioners in an ever-changing environment (Litchfield, Shukla, & Greenfield, 2021; Esteban-Navarro, García-Madurga, Morte-Nadal, & Nogales-Bocio, 2020). This timely and reliable evidence was important in the advancement of the findings to the next level of the study. Thus, concise search terms and Boolean operators was generated, and as demanded by this methodology, the guidelines for Preferred Reporting Items for Systematic Reviews and Meta Analyses were adhered to.

D. INCLUSION CRITERIA

The inclusion and exclusion criteria were clearly stated as shown in Figure 1. Studies which met the following conditions were considered:

- ✓ Exclusively Kenyan rural ICTs, Pasha centre or Digital village.
- ✓ Only full and complete papers were considered, excluding abstracts only and
- ✓ All papers must be published between January 2011 and December 2023.
- ✓ Papers whose content was presented in English language

E. STUDY SELECTION

During selection, the process adhered to the four Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) stages: identification, screening, eligibility, and final inclusion, with the search data illustrated in the PRISMA diagram (see Figure 1).

F. ANALYSIS PROCEDURES

A descriptive outline of each study's findings was generated. The findings were analyzed by computing the frequency of a concern or counting the number of times an issue was mentioned by different authors.

G. SEARCH STRATEGY

We conducted a search for relevant data on Google Scholar and the ICTA website. For Google Scholar, we employed a Boolean expression combining the keywords related to rural ICTs, or search terms "pasha centres", "rural ICTs", "digital village", "rural technology", and the keywords related to challenges, "challenges," "barriers," "issues," "obstacles", "problems", "difficulties" and the keywords related to access and use "access", "adoption", "utilization", "use", "uptake" to identify studies that explored the challenges faced by people in rural areas in accessing and utilizing the deployed ICTs. The search on the ICTA website was performed manually, without the use of Boolean search techniques.

Combining keywords with Boolean operators gave us the following code:

("rural ICTs" OR "digital village" OR "pasha centres" OR "rural technology") AND ("challenges" OR "barriers" OR "obstacles" OR "issues" OR "difficulties" OR "problems") AND ("access" OR "adoption" OR "utilization" OR "use" OR "uptake")

This search string helped identify studies and articles that discussed the various challenges related to accessing and using rural ICTs.

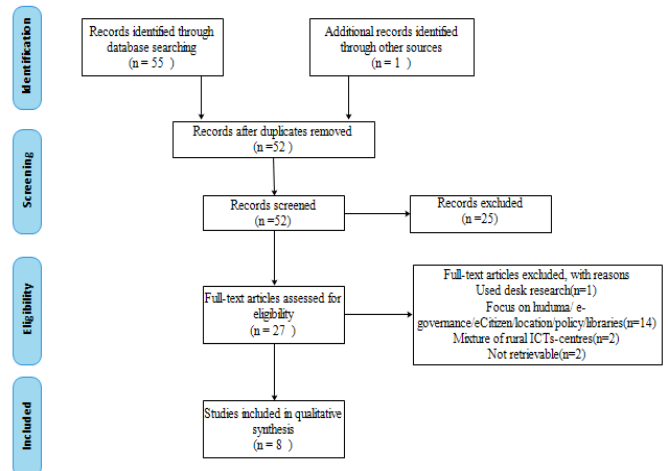


Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram

H. RESULTS

These studies reveals that lack of awareness, local content and illiteracy with a frequency of (n=7, 87.5%) each, are the most critical challenges to access and use of rural ICTs. Lack of stakeholder involvement in the design and implementation followed (n=6, 75.0%), high cost of services (62.5%), high poverty rate (62.5%, low bandwidth (62.5%), motivation (50%) and lack of technical support (62.5%). Table 1 summarizes these findings.

Although the language barrier at 37.5% may seem trivial as compared to those other issues, Hallberg, Godem, & Dzimey, (2012) through observation and interviews noted that this was a major problem in most of the centres. For example, users especially from Malindi did not understand English and Kiswahili, requiring content to be translated and presented in their native language.

Another notable finding involve the issue of the artifacts. The portal was not updated and slow (12.5%), it lacked vital information which would be useful to the community especially on e-health.

Also, there was a concern on the location (37.5%) of the Digital Villages, stating that there was no way in which a user could accept to spent 200 shillings on transport just to go use 30 shillings for the internet access.

Aside from high illiteracy level, the people living around these ICT centre were poor and could not afford the cost of internet access, save for few community individuals, majority of the users were tourists. According to these results, only one study applied observation strategy and did rigorous interviews to reveal various concerns.

Challenges	Frequency	Frequency(%)
Poor funding structures	3	37.5
Lack of branding	3	37.5
Lack of awareness	7	87.5
High cost of service	5	62.5
Illiteracy	7	87.5

Poverty	5	62.5
Stiff competition	3	37.5
Attitude/perception	4	50.0
Lack of local content	7	87.5
Poor Infrastructure	4	50.0
Poor business model	3	37.5
Low bandwidth	5	62.5
Slow portal	1	12.5
Lack Stakeholder involvement	6	75.0
Lack of technical support	5	62.5
No feedback from ICTA after assessment	1	12.5
Location	3	37.5
Language barrier	3	37.5
Lack of enough time to use the computers and internet	1	12.5
Misunderstood Pasha concept	2	25
Lack of training	3	37.5

Table 1: Kenyan Rural ICT Challenges

III. DISCUSSION

The systematic review showed that rural ICT intervention faced a number of challenges, rendering the government’s ICT project for rural areas unsuccessful. These challenges revealed key areas which create inequalities in access and use of ICTs among individuals in the rural areas. Studies, Atieno & Moturi, (2014) and Obora, Wanyoike, & Mokaya, (2014) agrees that their were no sufficient frameworks for implementing the ICTs. They further revelead that 21.8% of the implementation strategy could account for the success (uptake) of the ICTs. Salome (2012) stated that top-down driven approach fails to attend to lived reality and would impact negatively on the digital villages’ overall development potential, and sustainability. Therefore, their consensus was, targeted user demographics was neglected in implementation. Researchers (Aderibigbe & Gumbo, 2024; Nonvide, 2023) emphasize the importance of demographic consideration in implementation of rural ICTs. These demographics include age, level of education, gender, literacy level, and income (Van Dijk, 2020).

Critical limitations of these studies include their focus only on one divide (users) while leaving out the other divide (non-users) of rural ICTs. Except for Hallberg, Godem, & Dzimey, (2012), majority of the studies concentrated more on the ICT centres without looking into the challenges encountered while accessing artifacts or applications for disseminating information. Chigona, (2016) recommends evaluation of both innovations, the ICT centres. An artifact is an object made by humans with the intention that it is used to address a practical problem (Johannesson & Perjons, 2014).

This shows that even their suggested implementation frameworks or models fall short of the intended application’s design qualities.

Despite the limitations, this paper was able to obtaing vital information which could be utilized in the next phase of the study. Therefore, four themes were generated from the sytematic review findings, including sustainability, Technical support, ICT artifact attributes and user issues. Table 2 shows the themes and their corresponding codes.

Themes	Codes	
Sustainability	➤ Funding structures	
	➤ Branding	
	➤ Competition	
	➤ Business model	
	➤ Cost of services	
	➤ Awareness	
Technical support	➤ Training	
	➤ Infrastructure	
	➤ Bandwidth (network)	
ICT artifact attributes	➤ Support skills	
	➤ Local content	
	➤ Usability	
	➤ Reliability	
User issues	➤ Stakeholder involvement	
	➤ Illiteracy	➤ Poverty
	➤ Poverty	➤ Cost of access
	➤ Attitude/Motivation	➤ Time for access
	➤ Language barrier	➤ Literacy level
	➤ Limited time	➤ Education level
	➤ Digital skills	
	➤ Language barrier	
	➤ Attitude	
	➤ Motivation	

Table 2: Systematic review themes and codes

A. SUSTAINABILITY

Sustainability of rural ICT centers hinges on multiple critical factors (ITU, 2021). One significant focal point revolves around the funding framework, which is essential to be both steady and varied in order to guarantee enduring sustainability. The funding strategies ought to encompass governmental subsidies, investments from the private sector, and contributions from the community. An illustration of this is sustainable financing which can be realized via collaborations between the public and private sectors that harmonize initial governmental backing with innovative and effective private sector practices (UN, 2020).

Additionally, branding plays a significant role in sustainability, as well-branded ICT centers can attract more users and partnerships. “A brands are what the entity wants its target customer to think and feel about their products or service” (Mindrut, Manolica, & Roman, 2015). The decision-making process for choosing a brand is often influenced by anecdotal evidence. Simply having a great product is insufficient without a strong brand identity. When a potential customer can connect with previous experiences associated with a brand's identity, they are more likely to have developed a brand image and thus (prefer) (Mindrut, Manolica, & Roman, 2015) or relate to that specific brand, either in a negatively or positively. For example, their experience, knowledge or attitude towards a cybercafé could have influenced the access and use of rural ICTs offered via public

ICT centres. Thus, a strong brand increases visibility and credibility, drawing in both local and international support (Vaziri, Llonch-Andreu, & Lopez-Belbez, 2023).

Another essential factor is the competition faced by these centers. While competition can drive improvements and innovations, it can also threaten the survival of nascent ICT centers if not managed well. Creating a resilient business framework that integrates economical services customized to suit the requirements of rural areas is crucial (Kuteesa, Akpuokwe, & Udeh, 2024). These models should consider the affordability of services to ensure widespread access, as noted by Okello, (2024).

Raising awareness about the benefits of ICT and providing ongoing training for users are also vital for sustainability (Nimodiya & Ajankar, 2021; Bhuvanewari & Shree, 2022). Awareness campaigns can increase adoption rates, while continuous training ensures that users can effectively utilize the services offered (Nimodiya & Ajankar, 2021). Training programs should be inclusive, catering to diverse literacy levels to bridge the digital divide and ensure that all community members can benefit from ICT services (OECD, 2023; Psico-smart, 2024). By addressing these areas; funding structures, branding, competition, business models, cost of services, awareness, and training, rural ICT centers can achieve sustainability and significantly impact their communities.

B. TECHNICAL SUPPORT

The sustainability of rural ICT centers is heavily dependent on robust technical support, which encompasses infrastructure, bandwidth, and support skills (Roberts, Anderson, Skerratt, & Farrington, 2017). Sufficient infrastructure serves as the basis of every effective ICT project. It includes reliable electricity, proper housing for equipment, and secure environments to protect sensitive technologies (Kouladoum, 2023). As stipulated by Nchake, (2022), it is crucial for sustainable ICT initiatives to allocate resources towards robust infrastructure capable of enduring the environmental adversities commonly encountered in rural regions. Devoid of this essential component, even projects with the noblest of objectives are susceptible to failure as a result of recurrent equipment malfunctions and disruptions in service delivery.

Bandwidth and network support play equally vital roles in the area of information and communication technology (ICT) (Lai & Widmar, 2021). The provision of high-speed internet connectivity is indispensable for the effective delivery of ICT services; however, rural regions frequently encounter limitations in terms of bandwidth availability and reliability (Roberts, Anderson, Skerratt, & Farrington, 2017). This poses a significant obstacle to the optimal functioning of ICT centers in these areas, resulting in user dissatisfaction and low rates of adoption. It is important to ensure that rural ICT facilities have consistent and sufficient bandwidth to notably improve their efficiency and user contentment. Moreover, the technical expertise possessed by personnel overseeing these centers holds paramount importance. Implementing training programs that concentrate on enhancing these skills enables local staff to skillfully address issues and uphold the technology,

consequently reducing downtimes and ensuring uninterrupted operation (Ajayi & Udeh, 2024). Sustainable ICT endeavors ought to encompass continuous training and support mechanisms for local technicians to ensure their readiness in tackling emerging technical complexities.

C. USER ISSUES

Barnett, & Casper, (2001) defined rural communities as a network of socially complex environments where socio-cultural norms play a significant role in influencing community decision-making. Here the social environment of an individual can be understood as the culture that he or she was educated in and lives in, and the people and institutions with whom the person interacts. These cultural influences also affect the way people perceive and access information via ICT interventions and often inhibit information transfer. A study by Spector (1995) indicated that ignorance of these culturally divergent beliefs affects the adoption of ICT intervention. Existing ICT interventions rarely provide context specific solutions that incorporate the users' day-to-day behavior and technology exposure.

The use and access of rural ICTs by individuals in personal and positional categorical groups are significantly influenced by various user characteristics (Van Dijk, 2020). Poverty remains a critical barrier, as many rural residents cannot afford the cost of accessing ICT services. High costs of access, including fees for services and the price of necessary devices, often place ICTs out of reach for the economically disadvantaged (Dzator, Acheampong, Appiah-Otoo, & Dzator, 2023).

Additionally, time constraints related to access, particularly for individuals engaged in subsistence farming or other time-intensive occupations, limit their ability to utilize ICT resources effectively. Education and literacy levels also play a significant role; individuals with lower literacy or education levels may struggle to use digital technologies, thereby exacerbating digital inequalities (Mng'ong'ose & Victor, 2018).

Furthermore, digital skills and language barriers significantly impact ICT usage. Many individuals in rural areas lack the necessary skills to navigate digital interfaces (Mng'ong'ose & Victor, 2018). These interfaces can be particularly overwhelming for older adults or those with little exposure to technology (Wilson, Heinsch, Betts, Booth, & Kay-Lambkin, 2021). Language barriers add another layer of complexity, as many ICT platforms are not available in local languages, limiting their accessibility (Mng'ong'ose & Victor, 2018). Attitudes and motivation toward technology adoption also vary widely. While a divide of individuals may be willing to embrace new technologies, others may be resilient due to misunderstood concept, mistrust or fear of digital systems (Ferrari, et al., 2022). Enhancing digital literacy and providing localized user friendly ICT solutions can help mitigate these barriers. Motivational programs that demonstrate the tangible benefits of ICTs in improving livelihoods can foster a more positive attitude towards technological adoption (Karanja, 2019).

D. RURAL ICT ARTIFACT'S ATTRIBUTES

The effectiveness and accessibility of rural ICTs are significantly influenced by several key attributes, including local content, usability, reliability, and stakeholder involvement. Local content is essential for engaging rural users, as it ensures that the information and services provided are relevant and culturally appropriate (Chigona, 2016).

Usability is critical factor in access and use of rural ICTs. Rural ICT platforms need to be intuitive and easy to navigate, especially for users with limited digital skills or the illiterate. Unfortunately, users of rural ICTs often struggled to differentiate between the standard browser and the ICTA portal, with many unaware of the portal's existence. Those who were aware frequently found it slow, inefficient, and unreliable, thus diminished their motivation and negatively impacted their attitude toward using these technologies (Raikar & Gawade, 2017).

Reliability of ICT services is paramount, as frequent outages or slow performance can severely limit their utility and discourage continued use. Reliable infrastructure and consistent internet connectivity are necessary to maintain user trust and engagement (UN-Habitat, 2021).

Furthermore, the involvement of various stakeholders is imperative for the efficient implementation and sustained feasibility of ICT interventions in rural regions. Researchers (Vazquez, Madureira, Ostermann, & Pfeffer, 2023) noted that by involving local communities, governments, and private sector partners ensures the services meet the actual needs of the users and fosters a sense of ownership and commitment to the projects. This inclusive approach can help address barriers related to digital literacy, language, and cultural relevance, ultimately enhancing the accessibility and effectiveness of rural ICTs.

IV. CONCLUSION

Given the identified challenges, it is crucial to establish enduring initiatives that encompass rural areas, particularly the vulnerable in the society, including the poor and illiterate allowing them to reap the benefits of ICT just like their well able and literate counterparts. The integration of ICT in rural areas presents various opportunities such as better information accessibility, agricultural advancement, e-commerce and entrepreneurial prospects, enhanced healthcare services, financial inclusion, and skills enhancement. To capitalize on these opportunities, it is essential for the government, private sector, and community organizations to work together to invest in ICT infrastructure, encourage digital literacy, and provide customized programs and assistance.

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