

Assessing telecentres as a strategy for bridging the digital divide in rural communities of developing countries:

A narrative review

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ABSTRACT

Digital inclusion is increasingly recognized as a pathway to reducing social exclusion, as access to and meaningful use of ICTs enables individuals to participate more fully in economic, social, and civic life. However, a persistent digital divide continues to marginalize rural communities in developing countries, where socioeconomic vulnerability, infrastructural deficits, and limited digital literacy restrict opportunities for digital engagement. Telecentres have emerged as a widely adopted strategy to bridge this divide by offering public access to ICT infrastructure and skills training. Yet, despite numerous telecentre initiatives across South Asia, Southeast Asia, and Africa, questions persist about their effectiveness and long-term sustainability. A clear synthesis of evidence on how telecentres function within rural developing contexts remains underexplored.

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This study aims to assess the role of telecentres in addressing both the first-level digital divide (access) and the second-level digital divide (skills and meaningful use), identify challenges to their sustainability, and provide policy recommendations for improvement. Employing a narrative review methodology, the study synthesizes findings from eight empirical studies selected through comprehensive searches in Scopus and Web of Science. Thematic synthesis reveals that telecentres provide critical services that enhance digital access and literacy in rural communities. However, they face challenges categorized into technical, operational, socioeconomic-cultural, and policy/systemic dimensions. The study highlights recommendations, including infrastructure upgrades, capacity-building initiatives, localized content development, inclusive outreach strategies, and stakeholder collaboration. This review contributes to the discourse on digital inclusion by offering insights into how telecentres can be more effectively integrated into community development efforts, ultimately reducing social exclusion and promoting equitable access to digital resources in marginalized rural areas.

Keywords: Digital divide, Telecentres, Digital inclusion, Rural communities, Developing countries, Narrative review

Introduction

Information and Communication Technologies (ICTs) promises unprecedented opportunities for economic development, social inclusion, education, and civic participation (Ragnedda et al., 2022). It has become fundamental tools for navigating modern life and accessing essential services (Muñoz & Valencia, 2023). However, not every person or group or between or within country will have the equal opportunity to reap the benefits of information and communication technology because of social, cultural, and political impediments (Helsper & Reisdorf, 2017).

In industrialized nations, 90% of individuals used the Internet in 2021, compared to 57% in developing nations (ITU, 2024). Concerning disparities in connectivity and online access continue to exist in the world's rural areas, despite the fact that mobile broadband networks reach the vast majority of the world's urban areas. In metropolitan regions around the world in the year 2020, 76% of households had access to the Internet at home, which was almost twice as high as the percentage for families in rural areas (39%) (ibid). This disparity, broadly termed the 'digital divide,' remains a critical global challenge, particularly pronounced in rural communities of developing countries where limited infrastructure, economic constraints, and lower educational attainment often hinder ICT adoption and use (Dawood et al., 2019).

The digital divide has evolved into a complex, multi-layered phenomenon. Initially conceptualized in 1995 as the first-level digital divide, it primarily addressed disparities in physical access to ICT infrastructure, devices, and the Internet connectivity (NTIA, 1995). While ensuring access remains a foundational concern, subsequent research and

policy discussions have highlighted a deeper dimension. The second-level digital divide, introduced in the Organization for Economic Co-operation and Development (OECD) report in 2001, extends beyond connectivity to encompass variations in digital literacy, technical skills, user motivation, and the ability to translate access into meaningful engagement (Scheerder et al., 2017). Addressing both levels is crucial for ensuring that rural communities of developing countries can effectively participate in the digital age.

Rural communities reside in low-density regions, typically with fewer than 150 inhabitants per square kilometer (FAO & OECD, 2007). These areas often face limited infrastructure, restricted access to essential services, and an economy largely dependent on agriculture and traditional industries (Bezu, 2021). Similarly, the term "developing countries" is used to describe countries with a relatively low per capita income, typically poorly industrialized societies that lack fundamental health and sanitation services, pervasive poverty, and low literacy rates (Chantada et al., 2010). These interconnected barriers exacerbate inequalities in ICT access and digital participation, highlighting the urgent need for strategic interventions to effectively bridge the digital divide.

In bridging the digital divide, various initiatives have been implemented globally (Robinson et al., 2020). Among the most prominent, especially in developing contexts, are telecentres – publicly accessible facilities offering shared access to computers, the Internet, and often related support and training services (Oestmann, & Dymond, 2001). Telecentres, also referred to as community technology centres, information kiosks, cybercafés, digital hubs, ICT hubs, or public access points, are

frequently regarded as essential tools for bridging the digital divide (Furuholt & Sæbø, 2018).

However, the promise of telecentres has often been met with mixed results. While numerous initiatives have been launched, often with support from governments, NGOs, and international donors, questions persist regarding their long-term sustainability and their true effectiveness in achieving desired outcomes (Islam & Tsuji, 2011). Challenges related to funding, infrastructural limitations (like unreliable electricity or poor Internet connectivity), sociocultural barriers, lack of relevant content, and difficulties in maintaining community engagement frequently hinder their impact and longevity (Faroqi, Siddiquee, & Ullah, 2019). Furthermore, the extent to which telecentres successfully transition from providing basic access to fostering deeper digital competencies and usage remains a critical area of inquiry.

While numerous individual studies have explored specific telecentre initiatives or aspects of the digital divide (Faroqi et al., 2019; Ibrahim & Ainin, 2009; Islam & Tsuji, 2011), there is a need for a systematic synthesis of evidence that specifically examines their dual role in addressing both the first and second-level digital divides within the unique context of rural communities in developing countries. Such a review is essential to inform evidence-based strategies for policymakers, NGOs, and other relevant institutions, including libraries which often share similar goals of promoting information access and digital literacy within communities. This narrative review aims to address this gap by comprehensively synthesizing existing research literature.

Objectives

- To assess the role of telecentres in bridging the first-level digital divide (ICT access) and second-level digital divide (digital literacy and usage) in rural communities of developing countries.
- To identify systemic challenges that hinder the sustainability of telecentres.
- To provide evidence-based recommendations to enhance telecentre effectiveness and integration into sustainability.

Concept of Digital Divide

It was in Knoxville, Tennessee, in 1996, during a symposium on the digitization of American society, that Al Gore first used the term "digital divide". This event also marked one of the first occasions that the topic of the digital divide was brought up in public discourse (Ragnedda, 2017). However, the digital divide terminology has been defined by the US Department of Commerce's National Telecommunications and Information Administration (NTIA) through their reports in 1995, 1998 and 1999. According to them, digital divide is the socioeconomic disparity that exists between populations that have access to computers and the Internet and those that do not (NTIA, 1995,1998,1999).

At this early stage in the process of its development, the idea of the digital divide was most commonly understood to refer to the difference that exists between those who had access to modern technology and those who did not (van Dijk, 2020a). In its most basic terms, the digital divide was described as a type of inequality in access to modern ICTs, and in particular to the Internet (van Dijk, 2006). It was commonly called as a

first-level digital divide (Attewell, 2001). However, after some time, researchers and policy makers realized that this definition of the digital divide was too restrictive.

According to Attewell (2001), we have advanced from the first-level of the digital divide, which was mostly focused on access to the Internet, to the second-level, which is more complex and multidimensional and is based on the differences in how people utilize computers and the Internet. In other words, not only the physical connection to the Internet but also the various ways that it is used is taken into consideration. It reflects in the report of the OECD, 2001,

“The gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities” (, p5)

This definition clearly encompasses variations in Internet usage. Such disparities form the basis of the second-level of the digital divide, which addresses the skills required to use ICTs and the types of online activities people engage in, as well as the interactions between these digital divide elements (van Deursen & van Dijk, 2014).

Since around 2015, research and policy discussions have increasingly focused on the third-level digital divide, which goes beyond the first- and second-level divides (van Dijk, 2020b). While the first-level divide concerns access to digital technologies, and the second-level divide addresses differences in digital skills and usage, the third-level digital

divide highlights disparities in the outcomes of Internet use. The third-level digital divide addresses disparities in the returns from Internet use within groups of users who display generally similar usage profiles and who have largely autonomous and unhindered access to information and communication technologies as well as the Internet infrastructure (Helsper, van Deursen, & Eynon, 2015). Therefore, third-level divides pertain to variations in individuals' ability to translate their Internet access and use into offline outcomes. Therefore, research into the third-level divide attempts to determine who, and in what ways, benefits from Internet use in terms of a wide range of offline outcomes (Scheerder et al., 2017).

However, this study primarily focuses on the first- and second-level digital divides, examining how telecentres help bridge these gaps in rural communities in developing countries. The third-level digital divide, which relates to the outcomes of Internet use, is beyond the scope of this research and can be considered a separate area of study.

Methodology

This study employs a nonsystematic narrative review to examine the role of telecentres in bridging the digital divide in rural communities of developing countries. A narrative review provides a broad, thematic synthesis of existing research rather than adhering to structured inclusion/exclusion criteria or systematic screening processes (Green et al., 2006). This approach allows for a comprehensive discussion of telecentre effectiveness, sustainability, and policy implications.

A comprehensive literature search was conducted using Scopus and Web of Science; two widely recognized academic databases that provide rich publishing metadata, impact indicators, and extensive coverage across

disciplines (Pranckutė, 2021). Their continuous updating ensures access to high-quality peer-reviewed research relevant to telecentre initiatives. Search terms were carefully selected to capture literature discussing telecentre models, ICT access, and digital inclusion challenges, ensuring a broad yet focused scope of analysis. The search strategy incorporated Boolean operators to refine results, including:

- "rural community*" OR "rural area*" OR "rural population*"
- "telecentre*" OR "telecenter*" OR "ICT hub*"
- "digital divide" OR "digital inequalit*" OR "digital exclusion"

Additionally, Litmaps was leveraged to visualize citation networks and identify influential studies related to telecentre initiatives. This tool enabled a comprehensive mapping of key research themes, allowing for the selection of foundational and recent studies that contribute to the understanding of telecentre effectiveness.

Rather than applying strict inclusion/exclusion criteria, a diverse selection of studies was analyzed, with priority given to empirical research that offer a comprehensive exploration of telecentre effectiveness and challenges in the context of developing countries. This review synthesized findings from key studies that were thematically relevant.

Result and Discussion

The study primarily focused on literature that addresses the digital divide through telecentres initiatives in rural communities of developing countries. Therefore, only a limited number of relevant articles were identified and analyzed in order to address the study's objectives. The selected articles cover three geographic regions: South Asia, Southeast Asia, and Africa. In South Asia, studies were conducted in Sri Lanka (Gamage & Halpin, 2007) and Bangladesh (Siddiquee & Farqi, 2021). In Southeast Asia, one study was conducted in Malaysia (Hussain et al., 2009). The remaining studies were from Africa, including Botswana (Morakanyane, 2010), Malawi (Kapondera & Hart, 2016), Kenya (Chege et al., 2019), Tanzania (Lwoga & Chigona, 2020), and South Africa (Alao et al., 2021).

Table 1 presents a summary of the main characteristics of the studies included in the review. Among the included studies, three employed mixed methods (Gamage & Halpin, 2007; Siddiquee & Farqi, 2021; Kapondera & Hart, 2016), two utilized quantitative methods (Morakanyane, 2010; Hussain et al., 2009), and three adopted qualitative approaches (Chege et al., 2019; Lwoga & Chigona, 2020; Alao et al., 2021).

Table 1

Fundamental attributes of included studies

Author and Year	Telecentre's Name	Country	Target population and sample size	Research method	Data collection method
Gamage & Helpin, (2007)	Nanasalas	Sri Lanka	Rural community and 42 Nanasalas and 338 users	Mixed method	Interviews, observation, FGDs, and Survey
Siddiquee & Faruqi, (2021)	Union Digital Centers (UDCs)	Bangladesh	Rural community and 16 UDCs and 154 users	Mixed method	Interviews, and Survey
Morakanya ne (2010)	Kitsong Centres	Botswana	Rural community and 316 participants	Quantitative	Survey
Kapondera & Hart, (2016)	Lupaso Community Telecentre	Malawi	Rural community and 130 individuals	Mixed method	Survey, semi-structure interviews, and observation
Hussain et al., (2009)	E-community centres	Malaysia	Rural community's officers - 24	Quantitative	Survey
Chege, et al., (2019)	Maarifa Telecentres	Kenya	Rural community and 20 users and 13 administrative officers	Qualitative	Interviews and FGDs
Lwoga, & Chigona, (2020)	Sengerema Telecenter, Kilosa Rural Services and Electronic	Tanzania	Rural community and 73 individuals	Qualitative	FGD, Semi-Structure interview

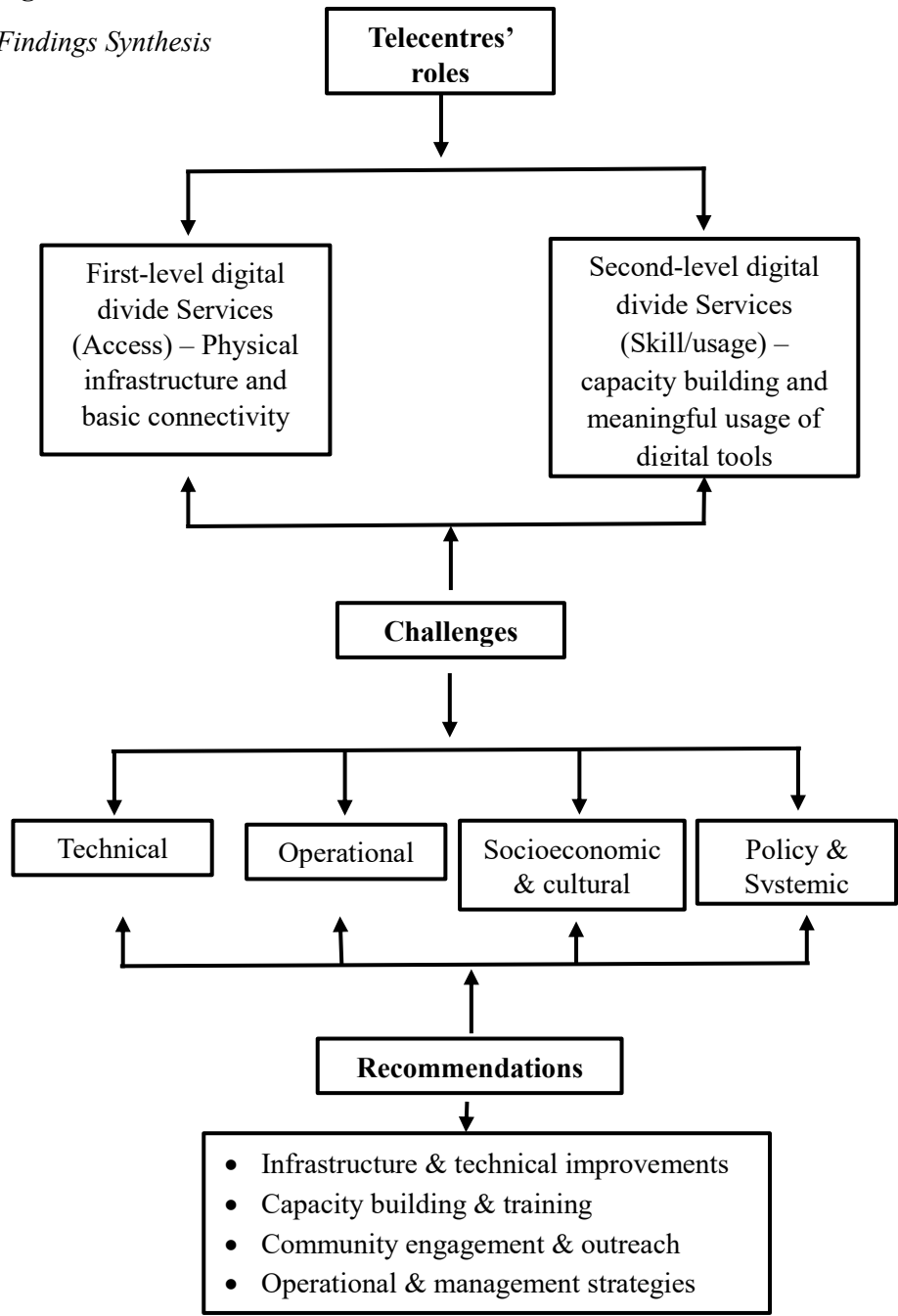
	Communication (KIRSEC), Somnambule Maarifa Center				
Alao, et al., (2021)	Cape Access Telecentres	South Africa	Rural community and 39 individuals	Qualitative	FGD, Semi-Structure interviews and observation

Source: Compiled by Authors

Synthesis of the findings

The reviewed studies provide strong evidence that telecentres contribute significantly to bridging both the first-level (access to digital infrastructure) and second-level (digital skills and meaningful use) digital divides among rural communities in developing countries. However, these initiatives encounter six key categories of challenges: technical, operational, socio-economic and cultural, and policy and systemic challenges. These challenges pose substantial threats to the sustainability of telecentres. Nevertheless, the analysis reveals several actionable and context-specific recommendations proposed by the studies to mitigate these challenges and enhance the long-term viability of telecentres. Figure 1 presents a synthesized framework summarizing these findings, while table 2 provide detailed summaries of the included studies.

Figure 1
Findings Synthesis



Source: Authors

Table 2
Telecentre's services, challenges and recommendations

Author and Year	Services Addressing First-Level Digital Divide	Services Addressing Second-Level Digital Divide	Challenges to Sustainability	Recommendations
Gamage & Helpin, (2007)	- Accessing the computers and internet - Scanning - Computer printing	- Computer training courses, - Use to basic communication - Use to e-commerce and information on employment - Use to national, international and local information resources	- Dependence on government subsidies. - Maintenance and supplies costs - Lack of management skills	- Improve Nanasala services based on community needs - Strategic location selection - Collaboration with public libraries - Increase awareness through targeted advertising issues identification for Nanasala operators - Make content available in local languages - Provide affordable and cost-effective equipment based on needs
Siddiquee & Farooqi, (2021)	Providing access to digital devices and internet for those lacking access.	- Use for information and services, both governmental and commercial, relevant and in line with the needs of rural people. - Computer training	- Insufficient income due to limited use of services - power blackouts - lack of high-speed internet - lack of integration with government agencies	- Ensuring contents are compatible, retaining, and reinforcing the current values and uniqueness of UDCs. - Scaling up current capacity and mandates to offer an increased level of services
Morakanyane (2010)	- Access to internet, email, locally generated content - secretarial and desktop publishing services (typing, photocopying, printing, scanning,	- Enhancing ICT skills - Distribution of locally generated information for rural economy development	- Lack of awareness - Poor marketing - Location of centres - Lack of a sustainability plan	- Develop a brand and marketing strategy - Find a more accessible location - Increase number of training staff - Introduce computing lesson - Collaborations with stakeholders

	laminating, and designing of programs and cards)	• Computer tutorials, access to information for personal development, • Skills improvement, and knowledge acquisition	• Lack of internet searching skills • Frequent electricity blackouts • Lack of local content • Fees charged • Unreliable power supply • Bureaucratic delays • Lack of expertise within the telecentre • Poor staff attitudes	• Enhance services with information literacy and literacy education programs • Provide programs targeting different community groups • Conduct regular community needs assessments • Invest in alternative power supply • Collaborate with organizations to create localized content • Ensure technical expertise within telecentres • Train staff in customer care
Kapondera & Hart, (2016)	• Provision of communication facilities • Office services (photocopying, printing, binding, lamination, scanning, faxing) • Internet access	• Basic computer course • MS Office course • Basic internet course • Awareness programs about <u>'importance of ICT'</u>	• Malfunctioned PCs and printers • Internet is not reliable	• Revise job specifications for ICT officers • Provide additional incentives for ICT officers • Prepare funding to develop computer-assisted language learning content • Implement consistent expert monitoring
Hussain et al., (2009)	• Internet connectivity • Computer devices accessibility • PC trouble shooting and maintenance services • Printing services	• Consolidating and creating relevant content to help satisfy users' information needs	• Poor infrastructure, including connectivity and internet access • Relevance of content	• Widen operations to serve communities outside Arid and Semi-Arid Lands • Set up more telecentres in convenient areas
Chege, et al., (2019)	• Providing access to computers and the Internet			

		• E-government services, e-commerce and agricultural development • ICT skills training	• Users' lack of ability to navigate the internet and analyze information • Limited operating hours • Lack of information content in local languages • High levels of poverty • Declining interest from donors	• Repackage information and share it widely • Enhance publicity using community media • Undertake aggressive seminars and sensitization programs to influence the community to relax cultural beliefs that restrict women
Lwoga, & Chigona, (2020)	• Internet and Digital devices access	• Computer training • access to information on health, education, and human rights • Use for communication with families/friends	• Inadequate computers, space, and personnel • Unreliable electrical power • Slow internet connectivity • Low-level of education • Language barrier • Lack of ICT skills and Low technology efficacy • Financial challenge	• Conduct regular assessments to understand rural women's needs • Guide rural women on accessing relevant website • Introduce demand-driven short courses including literacy programs • Introduce gender-sensitive ICT training programs collaborate with organizations and communities to develop local content • Explore alternative power sources and improve ICT infrastructure

Alao, et al., (2021)	• Free access to computers, internet, printing,	• Computer skills training (basic and ICDL certificates) • Support in job-seeking, applying for government grants • Awareness campaigns increasing access • Assistance by trained staff for ICT use	• Lack of computer skills, low education levels, language barriers (training mainly in English, not local languages), gender-biased usage patterns (male dominance), limited number of computers and space in centers, lack of awareness of telecentre services, unemployment, socio-cultural norms hindering women's access	• Promote awareness campaigns to increase telecentre utilization • Include women-specific empowerment programs in telecentre design and planning phase; • Provide training in local languages • Increase computer availability and space • Promote gender equality in use • Integrate telecentres strategically in ICT policies
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Source: Authors

Role of Telecentres in Rural Communities of Developing Countries

According to studies reviewed, rural communities of developing countries face socio-economic vulnerability. They often consist of marginalized and characterized communities by a high poverty line and low-income levels, with many living on very little, or even having no reported income among groups like unemployed youth and household workers (Kapondera & Hart, 2016; Siddiquee & Faruqi, 2021). Therefore, they are frequently described as financially disadvantaged and economically challenged, lacking the funds necessary to access essential services, including information services (Chege et al., 2019). Their livelihoods are often heavily reliant on traditional activities such as farming and fishing, although there is an observed shift towards non-farm income-generating activities in some areas (Kapondera & Hart, 2016).

As a result of such conditions, rural communities in many developing countries have experienced a persistent digital divide (Siddiquee & Faruqi, 2021). This divide restricts their participation in the digital age and contributes to their social exclusion from the broader information society. To mitigate this exclusion, several countries have introduced digital inclusion initiatives aimed at bridging the gap between individuals with and without access to digital technologies (Robinson et al., 2020). Among the several digital inclusion initiatives, telecentre is a key initiative in the rural areas and its central role is to bridge the digital divide (Watat & Mekonnen, 2020).

Telecentre is “a physical space that provides community access to ICTs with the purpose of enhancing educational, personal, social, and economic development” (Harris, 2001. p73). According to the reviewed

papers, telecentres play significant role for digital inclusion of rural communities. Its services can be categorized into two levels of the digital divide: the first-level, which emphasizes access to physical infrastructure, and the second-level, which focuses on skills development and meaningful use.

First-level digital divide services primarily ensure that communities have the necessary hardware and connectivity. According to Gamage and Halpin (2007), Nanasala telecentres in Sri Lanka offer essential first-level digital divide services by providing access to computers, Internet connectivity, and peripheral devices such as printers and scanners. Similarly, Alao et al. (2021) highlight that Cape Access telecentres in South Africa focus on offering free access to computers, Internet services, and printing facilities. Additionally, basic office services like photocopying, faxing, binding, laminating, and desktop publishing support help users fulfill day-to-day documentation needs, as reported by Morakanyane (2010) and Kapondera and Hart (2016). Technical support, including PC troubleshooting and maintenance, is also crucial in maintaining continued access, with Hussain et al. (2009) highlighting the role of PC repair services in rural settings.

On the other hand, services for bridging the second-level digital divide to develop the digital skills are required for productive engagement. For instance, Telecentres in Tanzania, and Malaysia, providing services to include digital literacy training, such as basic computer use and MS Office applications and Internet courses (Lwoga & Chigona, 2020; Hussain et al., 2009). Furthermore, Maarifa telecentre in Kenya, and Union Digital Centers in Bangladesh, promote the use of e-government and e-commerce

platforms, such as online banking and job portals for rural communities. (Chege et al., 2019; Siddiquee & Farooqi, 2021). Apart from that, the development and dissemination of localized content—covering health, education, and economic resources in native languages—help tailor digital engagement to community needs (Morakanyane, 2010; Kapondera & Hart, 2016). Finally, community empowerment initiatives address social inclusion through gender-sensitive programs, job-seeking support, and awareness campaigns, as demonstrated by Alao et al. (2021) and Gamage & Halpin (2007). Together, these two levels of services play a vital role in addressing both access and usage gaps in marginalized communities.

Overall, these initiatives represent critical efforts to bridge the digital divide by ensuring that rural communities have both the foundational infrastructure and the digital skills necessary for meaningful digital participation. By addressing hardware provision, basic connectivity needs, and offering digital skills training such as introductory courses and awareness programs on the importance of ICT—telecentres help lay the groundwork for deeper digital engagement. These efforts support not only individual empowerment but also contribute to broader community development.

Even though telecentres have contributed to bridging the digital divide and have played a role in enhancing and empowering the lives of rural communities, their implementation has not been without challenges. Telecentre programs in rural areas have often proven difficult to maintain and sustain over long term (Noor, 2021). The following section explores, with empirical evidence, the challenges that telecentres face in achieving long-term sustainability.

Challenges to Telecentres Sustainability in Rural Communities

Despite their potential, telecentres in rural areas face numerous challenges that hinder their effectiveness and long-term sustainability. According to the included studies, these challenges can be categorized into four main areas: technical, operational, socioeconomic and cultural, and policy/systemic.

Technical challenges:

Telecentres face significant technical challenges that impede their functionality, limit user adoption, and ultimately affect their sustainability. A primary issue is related to equipment, including the obsolescence or non-functioning nature of existing computers, printers, and other ICT tools (Chege et al., 2019; Hussain et al., 2009). Telecentres may also have an inadequate number of computers or insufficient physical space, restricting simultaneous access for users (Alao et al., 2021; Kapondera & Hart, 2016). Power supply problems represent another major technical hurdle, with Siddiquee & Faruqi, (2020); Kapondera & Hart, (2016), highlighting unreliable electrical power, frequent interruptions, or blackouts, particularly as primary constraints in rural areas. Connectivity issues are also prevalent, described as unreliable, slow Internet access, and unstable satellite connections, which prevent telecentres from being fully operational (Lwoga & Chigona, 2020).

The costs associated with these technical aspects are high; this includes the high cost of connectivity fees and the particularly high cost of supplies and maintenance for equipment such as multi-functional machines, cartridges, and toner, which can be a severe problem, especially as subsidies are reduced (Gamage & Halpin, 2007).

Operational challenges:

Telecentres face significant operational challenges related to their management and funding that threaten their sustainability. A major hurdle is funding shortages, often stemming from a dependence on subsidies (Chege et al., 2019; Gamage & Halpin, 2007). In Sri Lanka, Nanasalas telecentres, rely heavily on subsidies for things like connectivity which are often phased out over time (Gamage & Halpin, 2007). Operators express concern that they will not be able to maintain current service rates once subsidies are reduced and generating sufficient income from limited-service use remains a challenge (ibid). Linked to funding are poor maintenance practices and the high costs associated with repairs and supplies (Kapondera & Hart, 2016)

Staffing issues also pose challenges to operate telecentres continuously, including a lack of trained personnel and poor attitudes (Kapondera & Hart, 2016; Lwoga & Chigona, 2020). Users have also reported a lack of support when trying to use the telecentre services (Kapondera & Hart, 2016). Furthermore, location problems can severely limit accessibility and usage. Telecentres are situated in extremely remote or inaccessible locations, or those with locations that conflict with local customs or are simply far from the village center, see reduced patronage (Morakanyane, 2010).

Socioeconomic and cultural challenges:

Furthermore, Telecentres face significant socioeconomic and cultural challenges that create barriers for potential users and limit their integration into community life. widespread poverty among target communities directly impacts telecentre usage. Even when services are

offered, the cost of access can be prohibitive for individuals with low incomes. For many poor individuals from Tanzania and Kenya, basic needs like food, take precedence, and they may not perceive visiting a telecentre as an appropriate or affordable use of their limited resources (Chege et al., 2019; Lwoga & Chigona, 2020). The financial disadvantage of rural communities means they often lack the money required to pay for information services (Chege et al., 2019). This underscores how socioeconomic status profoundly affects the ability of individuals to benefit from telecentre services.

Language barriers pose a significant challenge to the effective use of telecentres, particularly when the available information and training are not offered in the local language (Alao et al., 2021; Kapondera & Hart, 2016). For instance, a study in Malawi highlighted the lack of information in Nkhonde, the dominant local language, as a major obstacle, as most resources in the telecentre library were in English, the country's official language (Kapondera & Hart, 2016). To address this, telecentres need to adapt their services to meet the linguistic needs of their communities, ensuring training and content are available in local languages.

Gender disparities can influence who accesses and benefits from telecentre services. While some studies specifically examine the experiences of rural women and the potential for telecentres to expand their capabilities (Alao et al., 2022; Lwoga & Chigona, 2020), cultural barriers can restrict women's participation (Chege et al., 2019). Disparities in literacy rates between genders can also contribute to uneven access to telecentres (Kapondera & Hart, 2016).

Policy and systemic challenges:

Telecentres frequently encounter significant policy and systemic challenges that arise from external institutional barriers and a lack of integrated strategic planning. A central issue is the lack of healthy government integration and coordination. For example, the study done by Siddiquee and Farooqi (2021) stated that, Union Digital Centers (UDCs) in Bangladesh, while intended as government service hubs, currently offer only a limited selection of government services. Critical services on information related to agriculture, health, and education are often not available through UDCs. This situation is attributed to issues such as insufficient infrastructure, complex policy hurdles, constraints from existing bureaucratic structures, and a lack of cross-agency cooperation. Furthermore, bureaucratic delays pose a notable barrier. In Malawi, accessing support for telecentres can be slowed by local management committees being slow to approve requests when supplies are needed (Kapondera & Hart, 2016). These delays contribute to weaknesses in telecentre management, especially in government-owned centres, hindering the timely purchase or repair of equipment (ibid).

Overall, challenges such as technical, operational, socioeconomic, cultural, policy-related, and systemic issues hinder the successful operation of telecentres. However, the reviewed articles also discuss policy recommendations aimed at addressing these challenges and ensuring sustainable operation. The following section explores these policy recommendations for enhancing the sustainability of telecentres.

Recommendations for Enhancing the Sustainability of Telecentres

The empirical research papers reviewed have suggested recommendations on how telecentres can be operated in a sustainable manner. These recommendations can be categorized into five key areas: infrastructure and technical improvement, capacity building and training, community engagement and outreach, operational and management strategies.

Infrastructure & Technical Improvements:

Upgrading connectivity through investment in high-speed Internet is a crucial step toward enhancing telecentre effectiveness (Siddiquee & Farooqi, 2021). To address power-related challenges, telecentres can adopt alternative energy sources such as solar power, which can help mitigate the impact of blackouts (Kapondera & Hart, 2016; Lwoga & Chigona, 2020). Ensuring access to affordable hardware and developing localized content in native languages are also essential for increasing relevance and usability (Alao et al., 2021; Chege et al., 2019). In addition, telecentre management should collaborate with academic institutions and other stakeholders to create and disseminate localized content to address the current gaps (Gamage & Halpin, 2007; Morakanyane, 2010). Beyond infrastructure, the availability of technical expertise is vital. This can be achieved either by employing dedicated technicians or through capacity-building initiatives for existing staff (Hussain et al., 2009).

Addressing these infrastructural and technical aspects is crucial, as a study has shown that challenges such as unreliable Internet connectivity and power supply often hinder telecentre operations (Mtega & Malekani, 2009). These improvements not only resolve fundamental access issues but

also help ensure that technology and information are relevant, sustainable, and effectively integrated within the community.

Capacity Building & Training:

Capacity building and training play a pivotal role in ensuring the long-term sustainability of telecentres. Offering digital literacy programs that encompass both basic ICT skills and more advanced courses is essential for equipping users with the competencies needed to effectively utilize telecentre services (Kapondera & Hart, 2016; Lwoga & Chigona, 2020). These programs not only empower individuals but also drive consistent usage of telecentres, fostering community reliance on their services.

Telecentre sustainability is further reinforced through gender-sensitive ICT training initiatives, particularly those targeting rural women. By offering flexible and accessible training that aligns with women's daily responsibilities, telecentres can promote inclusive participation and expand their user base (Alao et al., 2021). Increased engagement from women enhances the center's social impact and ensures broader community support, which is critical for long-term viability. In addition to user training, upskilling telecentre staff is crucial. Training in customer service, technical support, and ICT management improves service quality and operational efficiency (Kapondera & Hart, 2016). Well-trained staff can handle technical issues, support users more effectively, and contribute to the center's reputation and trustworthiness—factors that are vital for retaining users and securing institutional or governmental support.

Community Engagement & Outreach:

Effective community engagement and targeted outreach are fundamental to the success and sustained use of telecentres. A significant challenge noted is the lack of awareness about telecentres and the services they offer (Siddiquee & Farooqi, 2021), coupled with misconceptions that these centers are only for educated people or those proficient in official languages (Morakanyane, 2010). Therefore, policy and practice should strongly emphasize strategies to raise awareness about the existence and benefits of telecentres (Alao et al., 2021; Gamage & Halpin, 2007).

Crucially, community engagement must be rooted in understanding and responding to the specific needs and priorities of the local community. Services offered should be relevant, useful, appropriate, and compatible with the community's needs, values, and beliefs. This requires conducting needs assessments (Kapondera & Hart, 2016; Lwoga & Chigona, 2020). Providing services and information in local languages is considered vital for promoting better understanding, full adoption, and comfortable use of telecentres, especially in areas where mastery of official languages is low (Gamage & Halpin, 2007). Regularly assessing community needs ensures that services remain relevant over time.

Beyond direct user interaction, effective outreach involves building networks and partnerships with various stakeholders. This includes collaboration with other organizations, such as government agencies, the private sector, civil society, and NGOs, to gain support, resources, and legitimacy (Chege et al., 2019; Morakanyane, 2010). Partnering with existing institutions like public libraries is highlighted as beneficial, as they are already engaged in community services and possess expertise in

information management, which can complement telecentres' offerings (Gamage & Halpin, 2007).

Operational and Management Strategies:

Ensuring the long-term viability of telecentres is a crucial aspect of their operation and management. Policy and management strategies should focus on finding ways for these centers to be sustainable, recognizing that they cannot rely solely on external funding and subsidies. It is essential to identify methods through which telecentres can generate the necessary income to sustain their operations. Collaboration with other stakeholder organizations, including those from the public, private, and non-governmental sectors, is recommended as a means of support (Morakanyane, 2010). Support programs involving various agencies can further aid in the effective functioning of telecentres. Leveraging existing infrastructure, such as establishing telecentres in public libraries, is seen as beneficial due to their community orientation and established network (Gamage & Halpin, 2007).

The strategic location of telecentres also plays a significant role in their viability and accessibility. Policy should consider placing centers in locations that are easily accessible to the community, ideally in neutral areas (Morakanyane, 2010). Challenges such as poor roads can limit access for communities that are geographically isolated (Chege et al., 2019). In many rural areas, telecentres often serve as the primary, or sometimes the only, venues through which people can access ICT services and information.

Developing and promoting necessary support systems and appropriate policies are essential for ensuring the telecentres to be

sustainable in the long term. This includes aiming for the long-term, sustainable provision of services, which might involve exploring entrepreneurial models for telecentre operations (Gamage & Halpin, 2007). Introducing aggressive income-generating activities is explicitly recommended for ensuring the long-term sustainability of telecentres (Chege et al., 2019).

Monitoring and evaluation are important aspects of telecentre management to ensure their effectiveness and sustainability. Conducting regular impact assessments is recommended. Research suggests that analyzing the performance and impacts of telecentres is necessary to understand their contributions (Hussain et al., 2009). Evaluating the long-term sustainability of telecentres is frequently cited as a key objective for studies in this field.

Overall, enhancing the sustainability of telecentres in rural communities requires an integrated policy approach that addresses infrastructure, technical capacity, human resource development, community engagement, and operational management. The reviewed empirical literature underscores that merely providing access to ICT is insufficient; sustainability depends on continuous investment in connectivity, localized content, and skilled personnel. Equally important is fostering community trust and relevance through targeted outreach, gender-inclusive programs, and partnerships with key stakeholders. Strategic location planning, ongoing monitoring and evaluation further strengthen telecentre resilience. Collectively, these recommendations emphasize that sustainable telecentres are not just technology hubs—they

are dynamic community institutions that require thoughtful, context-specific planning and support to thrive in the long term.

Conclusion

This narrative review has synthesized existing empirical literature to assess the role of telecentres in bridging the digital divide in rural communities of developing countries. The findings affirm that telecentres play a vital role in addressing both the first-level digital divide by providing physical access to ICT infrastructure and the second-level divide by fostering digital literacy and meaningful use of digital tools. Through these services, telecentres act as important vehicles for promoting digital inclusion and enhancing the socio-economic well-being of rural population. However, despite their potential, telecentres face significant challenges that threaten their long-term sustainability. These include technical issues such as unreliable electricity and poor Internet connectivity; operational barriers like inadequate funding, poor maintenance, and untrained staff; as well as socio-cultural and policy-related obstacles that hinder effective usage and integration.

To address these issues, the reviewed studies offer a range of context-specific recommendations, including improvements in infrastructure, capacity-building initiatives, inclusive outreach strategies, and sustainable operational models. Emphasizing local language content, gender-sensitive programming, and partnerships with stakeholders such as libraries and NGOs is essential to increasing the relevance and reach of telecentre services. Ultimately, sustainable telecentres are not just technological access points but community-centric institutions that require holistic, inclusive, and coordinated approaches. By implementing the

identified strategies, policymakers and practitioners can enhance the effectiveness and longevity of telecentres, ensuring they serve as resilient pillars of digital empowerment for underserved rural communities.

This study is subject to several limitations. First, it focuses solely on the first- and second-level digital divides, omitting analysis of the third-level digital divide, which concerns the actual offline outcomes and benefits of digital engagement. Second, the review was limited to only eight empirical studies, which may restrict the generalizability of the findings. Third, the literature search was confined to two major databases namely, Scopus and Web of Science, potentially overlooking relevant studies published elsewhere, especially in grey literature or region-specific sources. Fourth, the study concentrates solely on rural communities in developing countries, thereby excluding other marginalized groups such as residents of informal urban settlements, older adults, refugees, indigenous populations, and ethnic minorities, who may also face significant digital exclusion.

Future research should expand upon this work by exploring how telecentres influence the third-level digital divide. Specifically, studies should examine whether telecentre use translates into tangible improvements in areas such as education, employment, income generation, health, civic participation, and overall quality of life. Moreover, future reviews should incorporate a broader range of databases and include grey literature to ensure a more comprehensive understanding of telecentre impacts. Longitudinal research designs would provide deeper insight into the long-term impacts and sustainability of telecentres. Expanding the

focus to include other underserved populations will be crucial for informing inclusive and context-sensitive digital inclusion policies.

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