Recommendations for sustainable post COVID-19 eLearning development in Rural Schools in South Africa

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Abstract
Prior to the COVID-19 pandemic, many ICT initiatives were implemented in rural schools across the country to improve teaching and learning. This paper discusses the various factors that contributed to the failure to sustain ICT initiatives. Due to the risk of infection associated with face-to-face contact during the COVID-19 Pandemic, eLearning proved to be the sole means of ensuring educational continuity. The objective of this paper is to highlight factors affecting sustainability and provide recommendations that can assist in ensuring sustainable ICT initiatives in rural schools after the COVID-19 pandemic. This is accomplished by conducting a scoping review to investigate the sustainability of ICT infrastructure to enable eLearning. The following academic databases are used for scoping literature reviews: ScienceDirect, IEEE Xplore, and search engines such as Google. A total of 41 papers out of 800 publications were deemed appropriate for the analysis. The findings show that physical, management, social, and educational conditions all have an impact on the sustainability of ICT initiatives; thus, addressing these components can ensure sustainability.

Keywords: (eLearning, COVID-19, ICT, rural-based schools, sustainability)

Introduction and background

The novel Coronavirus (COVID-19) is the cause of the highly contagious virus, which is passed from person to person through droplets from sneezing and coughing. Although the signs and symptoms of the virus are similar to those of a cold, it is severe and may cause serious illness and even death if not treated promptly by healthcare professionals (Zhu, Wei, and Niu, 2020). COVID-19 was initially discovered in Wuhan, China, in December 2019. After its discovery and the effects of the virus, the World Health Organization declared the virus a pandemic as it affected almost all nations (WHO, 2020). To flatten the curve and stop the spread of the disease, lockdown and staying indoors techniques were implemented (Sintema, 2020). On March 5, 2020, COVID-19 made its way to South Africa. As a result of lockdown and social distancing measures brought on by the COVID-19 epidemic, schools, training centers, and higher learning institutions were forced to

close (Ciotti, Ciccozzi, Terrinoni, Jiang, Wang, and Bernardini, 2020). South Africa's primary, secondary, and tertiary education systems have historically faced major challenges, such as large numbers of learners in classrooms, insufficient learner support material, a lack of clean water, insufficient and unsanitary 'bathroom' facilities, poor quality of teaching, and inadequate support, particularly in disadvantaged communities (Pillay, 2021). The COVID-19 pandemic exacerbated many of the challenges that learners and teachers already faced (Maree, 2022). Learning was up to one year behind schedule (UNICEF, 2021). Consequently, some matriculants had not written exams during that time, which also meant that learners in Grade 12 were not adequately prepared for the pending end-of-year exams (Maree, 2022). The South African Department of Basic Education (DBE) was unprepared for such a significant shift in the educational system (Maree, 2022). The unexpected change in the education system brought by COVID-19 had a significant impact on rural schools.

During this time, digital and online education (eLearning) became an integral part of the educational system where face to face contact posed the risk of infection. eLearning started in the late eighties and nineties as the first form of electronic education known as Computer-Based Training (CBT). This is considered the cornerstone of today's eLearning (Hubackova, 2015). The system itself made impressive progress. However, it lacked several eLearning features, like no time or location restrictions, and its content was not that extensive. Originating and developed in the United States, the information was first delivered only in text format, but in the early 1990s, browsers allowed users to add graphics to the text (Hubackova, 2015).

The upgraded system allowed communication between teachers and learners. Its main objective was to disseminate knowledge, but more importantly, to improve the educational system. However, there is a technological divide between urban and rural schools due to a lack of infrastructure and resources in rural schools (Zubane, Khoza, and Mlambo, 2022). The purpose of the study is to evaluate how COVID-19 contributed to the rapid adoption of eLearning in rural schools and to make recommendations to ensure eLearning sustainability post-COVID-19.

Methodology

Systematic reviews are research syntheses carried out by review groups with specialized expertise. They aim to locate and retrieve international evidence pertinent to a specific question(s). Systematic reviews adhere to a structured and predefined process and call for rigorous methods to ensure that the results are accurate and useful to the end users (Munn, Peters, Stern, Tufanaru, McArthur, and Aromataris, 2018). Scoping reviews offer a clear indication of the volume of literature and studies currently available as well as an overview, making them an excellent tool for determining the coverage or scope of a body of literature on a particular issue. When analysing new evidence and when it is not yet clear what more questions should be asked, scoping reviews are helpful (Munn et al., 2018). This paper was developed using a scoping review to investigate factors that affect the sustainability of ICT infrastructures to enable eLearning in South African rural schools. The databases used were ScienceDirect, IEEE Xplore and the search engine Google. The paper examined articles published between 2011 and 2022. The articles that discussed eLearning and rural schools; were written in English; and were relevant to the search were considered for inclusion. The exclusion criteria included non-English articles, alongside a screening process that eliminated duplicates, and abstracts. Out of 800 publications, 41 were appropriate for the study.

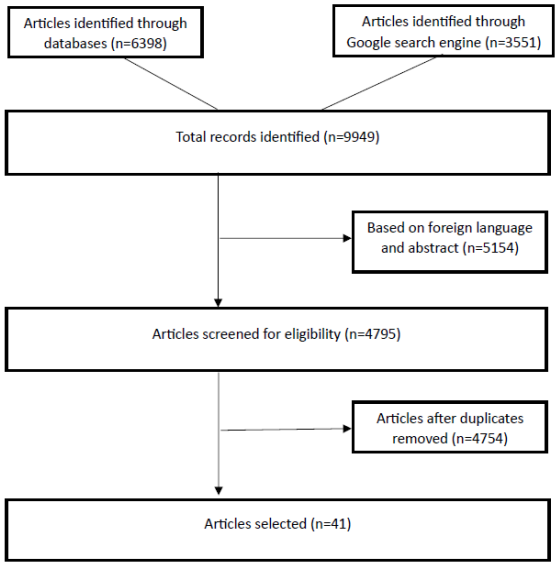

Figure 9: Process of record selection adapted from (Moher, Liberati, Tetzlaff, and Altman, 2009)

Literature

It is prudent to provide context and definitions for the terms 'eLearning' and 'rural learning' to ensure that the reader understands the contents of the paper.

eLearning is a method of constructing and validating knowledge through asynchronous and synchronous electronic communication. Internet connectivity and related communication technologies provide the backbone of eLearning. Hussain, Wang, and Rahim (2013) describes eLearning as using ICT resources to completely transform the learning process. Typically, eLearning is used in distance education, but it can also be used in conjunction with face-to-face instruction (Kahiigi Kigozi, Hansson, Danielson, Tusubira, and Vesisenaho, 2011). (Edem Adzovie and Jibril, 2022) define eLearning as any form of teaching and learning conducted electronically, such as through mobile phones or personal computers connected to the Internet. The authors broadened the definition to include audio/video recordings of lessons made by an instructor for the consumption of learners/students and vice versa. According to Al Rawashdeh, Mohammed, Al Arab, Alara, and Al-Rawashdeh (2021) eLearning offers more than just online content delivery. Knowledge sharing and collaborative learning enable individuals to connect and create a learning community in which part-time and full-time learners can actively participate in online degree courses selected from any location or place, providing people who are travelling or relocated, an easily accessible resource for experience and learning (Al Rawashdeh et al., 2021). In light of the outbreak of COVID-19, which forced all institutions in the country to switch to alternative methods of teaching and learning, an institutions survival was largely determined by its innovation, as well as the availability of the necessary infrastructure (Dwivedi, Hughes, Coombs, Constantiou, Duan, Edwards, Gupta, Lal, Misra, Prashant, Raman, Rana, Sharma, and Upadhyay, 2020).

The term rural settings refers to "farms and traditional areas that have a low population density, low economic activity, and a low level of infrastructure" (DBE, 2017:p6). In rural areas of South Africa, schools face a variety of challenges, including unstable electricity, high dropout rates, poor classroom infrastructure, and security issues (Adukaite, van Zyl, Şebnem, and Cantoni, 2017), and relevant to this study, the lack of qualified teachers and the lack of teaching and learning materials (Mestry and Ndhlovu, 2014). Consequently, the DBE recommended in their policy the increased diffusion of ICTs to rural schools to help reduce some of these problems, and benefit ICT stakeholders.

Pros and Cons of eLearning

Several educational institutions throughout the world were compelled to use online teaching and learning during the COVID-19 lockdown period to adhere to social distancing, and other public health measures implemented to contain the spread of the novel coronavirus (Kaisara and Bwalya, 2021). eLearning has created new opportunities for learning, such as making sure that learners are fully engaged since learning occurs in conjunction with texts, videos, sounds, collaborative sharing, and interactive graphics (Al Rawashdeh et al., 2021). Using the numerous eLearning technologies, learners are encouraged to collaborate, reflect, and build their own knowledge (Hošková-Mayerová and Rosická, 2015). Furthermore, it facilitates improved communication between instructors and learners and its flexibility allows learners the freedom to attend classes anytime and anywhere (Al Rawashdeh et al., 2021).

On the other hand, because eLearning is typically conducted in a remote and contemplative manner, this can result in a lack of learners involvement (Al Rawashdeh et al., 2021). In eLearning where evaluations are frequently conducted online, the authenticity of a particular learners work is a concern as almost anyone can complete a project in place of the learner themselves (Gherheș, Stoian, Fărcașiu, and Stanici, 2021). Consequently, unethical activities such as cheating, and plagiarism may become more prevalent (Amzalag, Shapira, and Dolev, 2022; Chiang, Zhu, and Yu, 2022). The cost of data for accessing eLearning platforms can be an issue for both learners and students (Kaisara and Bwalya, 2021). The cost of data has been cited as a key barrier to successful eLearning adoption in developing countries (Kibuku, Ochieng, and Wausi, 2020). Furthermore, the difficulty of teaching practical courses, the absence of direct interaction with the teacher, and spending too much time in front of a computer, phone, or other mobile device are some of the disadvantages of using an eLearning platform (Stecuła and Wolniak, 2022).

Measures taken to mitigate COVID-19's effect on the educational system.

eLearning technologies such as the Internet, radio, television, phone messaging, and email communication could be used to support continuity in the education sector (Basilaia and Kvavadze, 2020). In South Africa, Ghana, Eswatini, and Lesotho, online libraries, guidelines, resources, video lectures, and television broadcasts were implemented to continue the education process during the pandemic (Sengai, Mokhele, and Makumane, 2022). The Ghanaian used $15 million of the money provided by the World Bank to implement a remote learning system to ensure continued learning, recovery, and resilience for basic education (World Bank, 2020; Okertchiri, 2021). To facilitate learning during lockdown, Eswatini's government teamed up with the country's two major mobile service providers to offer study bundles at reasonable rates (Pitikoe, Ferreira-Meyers, Bhebhe, and Dlamini-Zwane, 2021). According to Christie (2021), the DBE of South Africa appeared to respond more diligently to the impact of COVID-19 on

the school system. Lesotho's interventions indicated an insufficient level of readiness for technology integration across the curriculum (Sengai et al., 2022). Resources were provided to learners across all grades, including educational broadcasts on radio and television, eLearning through platforms such as Microsoft Teams and Zoom, as well as worksheets and exam papers (Sengai et al., 2022).

Discussion and recommendation

To transition from traditional teaching to an electronic environment, the use of eLearning has emerged in the context of modern information technology and has been incorporated into the educational programs of many schools (Msiza, Malatji, and Mphahlele, 2020). In an effort to raise educational standards and transition to paperless classrooms, many ICT initiatives were deployed throughout the country to improve not only the educational sector but also the rural areas. The section below discusses only two ICT initiatives (Classrooms of the future, and ICT4RED) that were implemented pre-COVID-19 Pandemic in South Africa:

Classroom of the future

According to Msiza et al. (2020), the Gauteng Department of Education (GDE) adopted the global eLearning trend with the goal of introducing "classrooms of the future." At a school in Gauteng, the first "classroom of the future" was unveiled by Cyril Ramaphosa, who was then the deputy president, and David Makhura, the then premier of Gauteng (Falanga, 2015). A total of 1800 grade 12 classrooms in 377 schools were equipped by July 2015. By July 2016, the project had covered over 2300 grade 11 classrooms (Mugani, 2020). Additionally, in 2017, 83 fee-paying secondary schools were added with the goal to integrate all rural secondary schools. To reach an additional 3100 classrooms, the project is currently focusing on the grade 10 rollout in rural schools (Mugani, 2020). Furthermore, to facilitate eLearning in schools, the government gave teachers the necessary training and development to equip them with the necessary skills. The GDE invested R 724 million in the 2017/2018 financial year to continue the rollout of its eLearning strategy as part of the implementation process (Msiza et al., 2020).

Any rural school that achieves a matric pass rate of 100% is automatically accepted into the project, receiving end-to-end support from grades eight through twelve (Mugani, 2020). All classrooms of the future schools have Internet access and have access to eLearning and ICT solutions (Mugani, 2020). The classroom of the future has improved instruction and learning, making it simpler and more enjoyable for teachers. Learners have gained confidence, especially in using technology, and their achievements have improved since 2015 (Mugani, 2020). Furthermore, the system allows matric learners to apply to tertiary institutions in an easy and cost-effective manner. School security has become a concern now that criminals are targeting schools with devices that deliver the benefits of the classroom of the future (Mugani, 2020). Despite some incidents of theft, all tablets are equipped with tracking devices (Mugani, 2020).

Following are some suggestions for how the classroom of the future will be different from current classrooms: With individualized instruction, online testing, and assessments, the classroom of the future is expected to be more creative and exciting. Schoolnet India (2022), state that learners will have more control over their educational experience.

- **Learning will become personalised:** A personalized environment emphasizes individual learner growth, often through skill-based and cooperative groups (Basham, Hall, Carter Jr, and Stahl, 2016). It is active and complex as it takes individual's

learning preferences and requirements into account. According to Pane, Steiner, Baird, Hamilton, and Pane (2017), teachers can have access to "learner profiles" that learners create in classrooms of the future to enable them to design personalized learning pathways for each individual based on their preferences, goals, weaknesses, and strengths.

- **Virtual and augmented reality:** The use of virtual and augmented reality technology allows learners to experience the content they're learning more realistically. With a handheld device, learners can travel around the world without ever leaving the classroom (King and South, 2017).
- **Flexible assignments:** Learners are not bound to a set of guidelines to prove their abilities through flexible assignments. Flexibility of assignments motivates them to research more, have enriching conversations, apply their knowledge, and learn more (Zayapragassarazan, 2020). In terms of evaluation, flexible assignments break the pattern of either correcting written assignments or reading through a set of similar information; instead, teachers are more likely to be interested in testing a learner's grasp of the subject (Sharma, 2021).
- **Cloud computing:** Cloud computing allows teachers and learners to collaborate and complete work from any device with an Internet connection. Kumar and Bhardwaj (2020:103) posit that cloud computing in education improves school performance, learner success, reduces teachers' workloads, and increases healthy competition among learners. Using cloud computing in classrooms of the future will allow teachers to take advantage of new and innovative classroom structures that allow learners to have more face-to-face time with their classmates at school while also being able to access lessons and assignments from home, resulting in a truly innovative and modern classroom (Vandis, 2019; Mali and Kothari, 2020).
- **Deep learning:** Is a technology that has the potential to completely alter the way that education is currently approached. By mimicking how the human brain works, deep learning machines will be able to engage in autonomous thinking and learning. For learners who need more assistance, this could have significant effects, such as matching them with teachers who are available through flexible scheduling or learning analytics tools. Future classrooms that emphasize deep learning will in many ways tailor each learner's educational experience to fit their particular needs and rate of learning (Gleason, 2020:300).

ICT4RED

From 2012 to 2016, Technology for Rural Education Development (ICT4RED) was a project that introduced technology (tablets and supporting ICT infrastructure) to 26 rural schools in the Nciba circuit of Cofimvaba in the Eastern Cape. The objective of the program was to support evidence-informed learning for policymakers and practitioners (Botha and Herselman, 2013). The ICT4RED initiative was a component of the Technology for Rural Educational Development (TECH4RED) research program, which aimed to improve rural education through technology-led innovation (Botha and Herselman, 2013). It was founded by the Department of Science and Technology (DST) in partnership with the Departments of Basic Education (DBE) and Education (ECDoE). ICT4RED was looking into the effects of giving tablets to 26 rural schools in the Cofimvaba school districts Nciba Circuit, which is the ICT emphasis of the TECH4RED program (Ford, Botha, and Herselman, 2014). The challenge was to implement technology in a way that would enhance teaching and learning, support sustainability beyond the project, and ensure true integration into existing educational processes, while managing very real logistical and infrastructure issues (Ford et al., 2014). The ICT4RED

initiative is based on the understanding that more significant changes to the educational system cannot be made by education departments alone but instead require the combined efforts of public and private partners, as well as civil society at the national, provincial, district, and circuit levels. Schools, provincial government, NGOs, and business sector organizations (working on comparable rollouts now) are all part of the target market (Herselman and Botha, 2014). The initiatives worth lies in its multidisciplinary implementation in a rural educational setting. The ICT4RED initiative was developed by leveraging knowledge from comparable international initiatives (Herselman and Botha, 2014).

All teachers were required to participate in the ICT4RED Teacher Professional Development Course as part of the initiative (Nkula, 2015). The course is made up of ten modules. Each module gave the teacher a fresh approach to teaching strategy, useful tools for assessment, and technological know-how (Botha and Herselman, 2013). The goal of the course was to transform teachers' practices from teacher-centred to learner-centred by utilizing hands on teaching methodologies, therefore it goes beyond simply teaching learners how to use tablets (Botha and Herselman, 2013). Teachers receive a badge after finishing a module. There are one or more badges associated with each module. All teachers provided proof that they used the teaching method in the classroom and incorporated technology and topic knowledge (content knowledge) into a lesson to receive the badges. The badge facilitator receives the proof, examines it, and grants the badge (Botha and Herselman, 2013).

The Department of Science and Technology requested that the ICT4RED TPD course be modified and implemented in the Square Kilometre Array (SKA) e-Schools as part of the Human Capital Development mandate to stimulate a sustainable pipeline for local rural youth employment and community upliftment. The Department of Rural Development and Land Reform (DRDLR) contracted the CSIR in 2016 to install technology in 24 rural schools, this was done in order to build on the successes of the ICT4RED initiative (Botha, Herselman, Rametse, and Maremi, 2017). The DRDLR ICT for Education (ICT4E) initiative is the name of this endeavour. The DRDLR identified 24 rural schools in 7 regions of South Africa (Botha, Herselman, Musgrave, and Jaeschke, 2017). Unfortunately, the ICT infrastructures are not sustainable beyond the project due to the factors presented below.

Factors affecting sustainability.
Meurer, Müller, Simone, Wagner, and Wulf (2018) claim that it is difficult to sustain IT-based solutions. Furthermore, for a design outcome to be adopted, maintained, and finally further developed, it is necessary to investigate the circumstances both inside and outside of a research project. This is because sustainability is a bigger concern (Meurer et al., 2018). Despite the efforts made to enhance rural schools using ICT infrastructures and training for teachers in utilizing these devices, factors that impact sustainability are:

i. **e-Readiness –** ICT4RED had great success equipping teachers with the tools they need to educate using technology and implementing 21st century teaching techniques at the school level (Ford, 2016). Unfortunately, local and provincial structures did not adopt this success (Ford, 2016). One of the issues was "readiness" at the school, district, provincial, and national levels (Dlamini, Meyer, Marais, and Ford, 2017). Traditionally, e-readiness assessments evaluate the physical, management, social, and pedagogical circumstances in place that lead to

receptiveness to the introduction of ICTs in order to determine the capacity of a school to use them (Dlamini et al., 2017).

ii. **Social –** The social component of sustainability in this section focuses on the skills level provided to the beneficiaries of these ICT initiatives as discussed below:

- **Skills** – Despite receiving adequate training on the utilization of these ICT infrastructures, it is easy to fall back on the traditional norm of teaching and learning. Cooperative education is one such strategy, combining classroom learning with training, a foundation to the concept of acquiring knowledge by doing. Training needs to be conducted between learners and teachers in rural based schools on the use of ICT devices and infrastructure. This will familiarize them with the many concepts such as device management, infrastructure maintenance, troubleshooting and security (UGWU and Nnaekwe, 2019). Most of the time, teachers in rural schools are required to teach a variety of subjects to a range of grade levels in a single class. Undoubtedly, this had significant effects on teachers' ability to organize lessons for each day and each period, balance their time between teaching various grade levels, carry out assessments of their learners' progress, and uphold discipline (Du Plessis and Mestry, 2019).

iii. **Physical –** The focus of the physical sustainability component in this paper is on two factors: theft and connectivity. These elements are crucial because they are the main cause of unsustainable development. According to literature research, ICT initiatives are frequently implemented in schools but fail because of inadequate security, which leads to the theft of equipment after government projects.

- **Theft** – When rural schools are connected, they frequently lack either basic security measures to prevent device theft or adequate training for teachers and administrators on how to use the Internet in an effective pedagogical manner (Msiza et al., 2020). Concerns about insurance prices are also brought up by security and device theft challenges. The money for ongoing device insurance must be independently provided by the schools. Many schools cannot otherwise afford insurance on their own, and the DBE has not increased its budgetary allocation for it. Due to their limited budgets, schools simply lack the resources needed to protect their equipment (Du Plessis and Mestry, 2019). As a result, after the ICT infrastructures have been implemented and set up in schools, they are often stolen. The time, money, and effort put into connecting the school will be lost if there is no insurance because the equipment won't be replaced (Du Plessis and Mestry, 2019).
- **Connectivity** – A major problem in South Africa is network connectivity. Many schools are found in isolated rural arears, which makes it nearly impossible to establish a strong network connection. To ensure the continuity of online education, a sufficient bandwidth is essential. Otherwise, connections become incredibly slow and unreliable, making it difficult to broadcast, access resources, etc. (Graves, Abshire, Amiri, and Mackelprang, 2021). Additionally, eLearning is now more affected than ever before due to load shedding (electrical power outages). Electricity is a necessity for most network transmitters. In remote locations where transmitters are dispersed, this makes it difficult to access a stable connection. The bandwidth allocated becomes limited when there is an unstable network connection. Low bandwidth will cause multimedia streaming to malfunction, even causing video streaming to cease (Graves et al., 2021). Users of Internet connectivity in remote schools (teachers, learners, and SMT members) often complain about the inadequate Internet connectivity that hinders their productivity (Msiza et al., 2020).

iv. **Management –**In order to accomplish specified goals in the most effective and efficient way possible, management is the process for organizing a company's

actions and resources (Griffin, 2021). The two projects mentioned above demonstrate how well the government plans every project, from selecting the beneficiaries to implementing ICT initiatives in rural schools. However, the government does not plan beyond the project, and as a result, the ICT infrastructures are not sustained beyond the project due to theft, financial restrictions, etc.

v. **Educational Conditions –** Facilities in rural schools especially in primary schools, are mostly in an unacceptable state. Many buildings were erected using mud blocks many years ago (Du Plessis and Mestry, 2019). In some areas classes are held in incomplete classroom structures. The few classrooms that are completed are overcrowded during the rainy seasons. Many schools lack the essential infrastructure to function as safe, efficient, and effective schools. Most rural schools have no water, sanitation, or electricity. Not all schools are fenced in, which makes it easy for intruders to enter and vandalise the school. Textbooks need to be transferred to the few classrooms that can be locked. It then takes up time during the first lesson of the day to get these textbooks to the respective classrooms where the books are needed. In some of the rural schools, furniture is stolen and classrooms are often used as toilets, especially those classrooms that cannot be locked (Du Plessis and Mestry, 2019).

Recommendations

- The government should consider allocating a financial budget to cover tablet costs, maintenance, technical support, ICT insurance, data storage, and teacher ICT training.
- Other ICT initiatives prohibited learners and teachers from taking ICT infrastructures like tablets home for security reasons; this should be thought of to reduce theft. the school should create a plan that discretely assigns the tablets to teachers and learners so that the community and other learners are unaware of the identified individuals responsible for safeguarding these devices.
- To assist schools in managing their ICT infrastructures, the ICT4RED initiative trained ICT Champions (NARYSEC), who were paid by the government for a two-year period. However, after the contract expired, schools were left without support, and it was frequently not possible to find additional funding to extend the contract of the ICT Champions (NARYSEC). It must be mandated that all schools must hire competent, well-trained technicians who can provide technical support to teachers and manage networks on a permanent basis in order to ensure continuity (Mabila, Van Biljon, and Herselman, 2017). A budget must also be allocated for such a role from the department.
- Partner with private organizations to provide inexpensive broadband for the community and broadband access for rural schools. This will increase network connectivity and enable learners and teachers to stream and continue working and learning from home.
- The "implementation readiness assessment framework" developed by Dlamini et al. (2017) should be used by the government, as it broadens the definition of "e-readiness" to encompass all stakeholders in the educational value chain. The framework is meant to be utilized prior to the launch of an ICT4D project. The framework is intended to make it easier for the implementation team to recognize problems that should be given priority, attention, and management throughout the implementation process as they are anticipated to have a long-term impact on sustained benefit delivery. The school, the neighbourhood, and the supportive environment (Provincial and National Departments of Education) are all included in this. Additionally, it is necessary to evaluate how

prepared the implementation team is to interact with the environment (Dlamini et al., 2017).

- Job opportunities can also ensure sustainability in the rural areas, as many people are uneducated and unemployed. Unemployment creates a high rate of poverty and thus increasing theft in the rural areas.

Conclusion

Despite numerous ICT initiatives being deployed to rural schools to enhance pedagogical practices and classroom practices, most of these initiatives were not adopted as anticipated due to factors discussed in the discussion section of this paper. During the COVID-19 pandemic, when schools shut down and eLearning was the only way to ensure educational continuity, the factors that affect sustainability were not important. In this time, the South African educational system began to recognize the value of eLearning. The challenges that the schools faced during the COVID-19 pandemic were presented in the literature, and it became clearer that connection problems, data costs, and load shedding were the biggest problems that learners, students, teachers, and lecturers, particularly in rural areas, had to deal with. Although load shedding is not the focus of this paper, it is a problem that, regrettably, prevents learners from actively participating in school activities, particularly when it comes to online classes, online assignments, and online resource access. Prior to the COVID-19 Pandemic, theft, e-readiness, skills, the physical layout of the schools, and connectivity were barriers to the sustainability of ICT infrastructures. This paper shows that this is still the case today. This paper offers recommendations that the Government could consider when implementing future ICT initiatives in South African rural schools to ensure sustainable implementations of ICT initiatives.

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