

Barriers to sustainable integration of ICT in Pietermaritzburg public secondary schools



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ABSTRACT

The integration of Information and Communication Technology (ICT) in education has the potential to enhance teaching and learning; however, several barriers hinder its effective adoption in South African schools. The paper reports on the study that examined the barrier to sustainable integration of ICT in Pietermaritzburg public secondary schools. The study used qualitative interview technique to collect data from 20 teachers. The Technology Organisation Environment (TOE) framework was used as a theoretical framework. The findings reveal that a lack of technological pedagogical content knowledge among teachers, high ICT infrastructure support costs, resource constraints, resistance to change, and theft and vandalization of ICT equipment significantly impact ICT adoption. Many teachers lack essential ICT skills, which affects their confidence in integrating technology into their teaching practices. Financial constraints further limit schools from maintaining ICT infrastructure, and resistance from experienced educators impedes change. Additionally, frequent theft and vandalization of ICT resources pose a serious risk, further hampering implementation. To address these challenges, the study recommends capacity-building initiatives to enhance teacher training, increased financial and technical support for schools, leadership-driven encouragement of ICT adoption, targeted awareness campaigns to mitigate resistance, strengthened security measures to protect ICT infrastructure, and equitable distribution of ICT resources to bridge the digital divide. A strategic and collaborative approach is essential to overcoming these barriers and ensuring effective ICT integration in South African schools.

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Introduction

There has been a rapid growth in the use of ICT in education around the globe, especially in developed and developing countries. In a global context, many projects have been implemented to facilitate technology integration and incorporate ICT tools such as interactive whiteboards, tablets, laptops, and projectors in the schools in addition to educational software, internet connectivity infrastructure, and other ICT-related equipment (Falloon, 2015; MoNE, 2017). As ICT integration advances in schools, it is evident that research on technology integration has increased. Various studies investigating the effects of the use of several technologies in education have determined that integration of ICT positively affects teaching and learning when applied with proper pedagogical methods (Albaaly & Higgins, 2012; Erbas, Ince, & Kaya, 2015; Malik & Shanwal, 2017).

In South Africa, ICT use in schools was introduced in the 1980s, however, mainly in private schools and a few privileged government schools. In addition, computer use in schools initially focused on administrative duties such as capturing marks, student records, school reports, and timetables, which went on to change with the advancement of ICT. With the coming of the fourth industrial revolution (4IR), together with the unprecedented COVID-19 pandemic, there have been huge attempts to achieve integration of ICT in the curriculum to safely facilitate teaching and learning as well as afford learners with skills that enable them to advance in an ever

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increasingly technology-based work environment. The South African government through the Department of Education embarked on a drive to promote ICT in schools. Several policies have been crafted to facilitate the initiative, including the White Paper on e-education (DoE, 2004), the Guideline on Teacher Training and Professional Development in ICT (DoE, 2007), and the Professional Development Framework for Digital Learning (Department of Basic Education, 2018). Despite these policies, many South African schools were not successful in integrating ICT into teaching and learning. The focus of this study was to examine the barriers to sustainable integration of ICT in schools.

Various players also participated in the implementation of ICT in education, these include non-governmental organisations (NGOs), ICT solution providers, and research institutions. For example, INTEL provides educators with insights on the integration of ICT into teaching and learning, in addition, SCOPE, which developed 11 teacher development modules for rollout into schools. SchoolnetSA also provides online programmes that offer in-service training to educators on integrating ICT into teaching and learning. With such active participation by different stakeholders, the expectation was to witness an ICT-integrated education system in action. However, evidence suggests that the opposite is prevailing as ICT is not yet fully integrated into the education system in South Africa. In the Department of Basic Education, RSA (2015b) Action Plan to 2019 report, the Department of Basic Education accepted that technology-integrated learning has not progressed in South Africa as anticipated. Disparity existed between government expectations and teacher practices (Mooketsi and Chigona, 2014). Therefore, it became imperative to share the findings of the barrier to sustainable integration of ICT in schools.

The study contributes knowledge on sustainable ICT integration for teaching and learning in public schools and the barriers thereof. Furthermore, this study offers an alternative way to examine the barrier to sustainable integration of ICT. Instead of the above, the primary objective of this paper was to examine the barrier to sustainable integration of ICT in Pietermaritzburg public secondary schools. The study sought to answer the research question, *What is the barrier to sustainable integration of ICT in Pietermaritzburg public secondary schools?*

The problem this study investigated was a lack of sustainable ICT integration in teaching and learning in Pietermaritzburg public secondary schools. It has become a known fact that the rapid growth of education technologies is “due to the capability of ICT in providing a dynamic and proactive teaching and learning environment” (Ghavifekr, Razak, Ghani, Ran, et al, 2014). Research further indicates that pedagogical technologies impact classroom engagements positively (Erbas, Ince, & Kaya, 2015; Malik & Shanwal, 2017). On the other hand, Padayachee, (2017) argues that ICT implementation is limited by operational, strategic, and pedagogic challenges. Whereas Nkadameng and Thaba-Nkadamene (2019) identify a lack of ICT implementation by Limpopo schools.

The school leaders and teachers were blamed for not doing enough to ensure the sustainable integration of ICT in teaching and learning. Mathevu and Uwezeyimana (2014) study conducted in Groot Letaba-Mopani secondary schools in Limpopo Province, South Africa identified a scarcity of ICT resources and inadequate ICT training with minimal or no impact. Mukhari’s (2016, iv) study conducted in Gauteng urban schools identified “inadequate ICT infrastructure; teachers’ lack of ICT skills; low level of ICT proficiency; inadequate training; negative attitudes and poor teacher confidence and lack of ICT leadership, funds, and technical support” as factors that hinder the successful ICT integration in urban schools.

Literature Review

The section below discusses literature about conceptualisation and differences between ICT and educational technology, ICT integration for teaching and learning, and the role of ICT in education, integration of ICT in Education, and ICT Integration in the South African Context.

Conceptualisation of ICT and educational technology

ICT can be defined as components and infrastructure that enable modern computing (Pratt, 2019). Pratt further defines ICT as all technologies that combined, allow people and organisations to interact, in the digital world. Ratheeswari (2018, 45) offers a comprehensive definition of ICT, by defining it as “technologies that provide access to information through telecommunication, and includes the internet, wireless networks, cell phones, and other communication mediums”. These components are included in Figure 1 below.

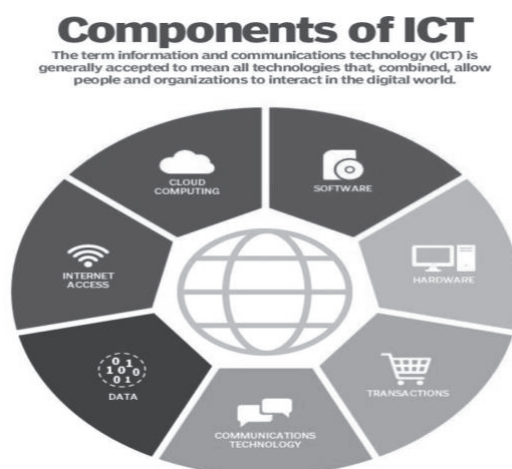


Figure 1: (Components of ICT; Source: Pratt @ Tech Target 2019)

Figure 1 supplements Pratt's (2019) definition of ICT, and includes components such as software, hardware, transactions, communication technology, data, internet access, and cloud computing.

On the other hand, Educational technology (E-Tech) is the use of technology for teaching and learning with a special focus on using new technology for innovative teaching (Hasa, 2020). It is important to clarify the difference, between ICT and E-Tech because some people use them as synonyms. The primary “difference between educational technology and information technology is that educational technology refers to the use of technological tools for the learning and teaching process, while information technology refers to anything related to computing technology, such as hardware, software, networking, and internet”.

Role of ICT in education

ICT provides a means of supporting the learning process in the teaching and learning environment. ICT is used to enhance the achievement of the learning outcomes. The random rollout of ICTs does not necessarily mean improved learner outcomes (Amory et al., 2015). In addition to supporting teaching and learning, ICT further supports the management of the education system. This includes the operations and the general business of delivering teaching and learning such as the ICT-enabled development of school timetables, learner records, and results analysis. In addition, ICT advances learner-centered learning where learners become creators of their knowledge through research activities and collaboration. According to Mart (2011). Furthermore, ICT integration enables learners to engage with learning materials in their own space outside the classroom (Ghavifekr, et al (2014) fostering lifelong independent learning (Chien, Wu, Hsu, 2014). In addition, ICT promotes the ongoing development of teaching instruction by educators in that educators can manage their work more effectively and efficiently (Makuna, 2013, Ahmed, Arshad, Tayyab, 2019). However, ICT integration into the curricular in developing countries remains a challenge (Isaacs, 2007), which is rather ironic in this 4IR.

Integration of ICT in education

Pedagogical integration of ICT requires availability of educational technology; network connectivity, and teachers' digital skills and willingness to venture into blended or virtual spaces. Although the Department of Education (2004) acknowledges the significance of developing and encouraging the advancement of superior thinking skills, it has not succeeded in providing all public schools with tools and skills to integrate ICT for teaching and learning

(Ndlovu & Donovan, 2012). Integration requires three principles, thus the lesson context, pedagogy, and ICTs to develop thinking skills. These elements are components of the Technological Pedagogical Context Knowledge (TPACK) by Mishra and Koehler (2006). The TPACK advocates for teachers' integration of pedagogical technology into the school curriculum. The teacher must have an “understanding of how particular topics, problems, or issues are organised, represented, and adapted to the deserved interests and abilities of learners, and represented for instruction” Sulman (1987). Technology becomes useful when teachers use good coordination for its infusion into lessons, with clear lesson objectives, teaching, learning, and assessment activities, coupled with clear explanations, demonstrations, and illustrations during lesson presentation that make it easy for learners to grasp concepts and further their understanding.

In addition, ICT integration into the teaching and learning environments requires the acceptance and recognition of new tools in teacher practice. The teacher must be able to strategically incorporate different media as part of managing the learning processes and activities. The teaching and learning processes and principles should not be sidelined because of excitement from educational technologies. The use and choice of technology should be based on how it fits in to enhance understanding of concepts as the lesson progresses. Educators must spend time preparing for ICT pedagogical integration. The literature demonstrates that educators are not fully integrating ICTs pedagogically, even though schools are buying computers (Polly et al. 2009). In instances where integration happened, a few educators have effectively integrated ICTs into the classroom (Krauss, 2014; Padayachee, 2016). Preparation for ICT pedagogical integration is time demanding as educators develop their peculiar material and adopt localised software for use in their classrooms (Ndlovu & Donovan, 2012). Educators need the basic knowledge, skills, and methods to align technology with their lessons. Bingimlas (2009) reports that educators lack ICT knowledge and the required skills to start the integration process. This is driven by a lack of ICT in-service training (Ozden, 2007). In most cases, educators are provided with basic training as the ICT equipment is delivered to their schools, thus diluting all the efforts for ICT integration (Albirini, 2006). Teacher ICT training is not happening at the level that capacitates them in developing required skills, and knowledge regarding the effective use of ICT in teaching. There is a lack of time to grasp and build upon the ICT concepts to construct knowledge. There is a misconception that providing technology solves the problems and fosters education (Tamim et al., 2015).

In addition, teacher training focuses more on ICT skills rather than the pedagogical component of it, in that regard, the product of such training cannot integrate ICT into teaching (Bingimlas, 2009). Gomes (2005) cited in Bingham (2009) suggests pedagogical and didactic training as essential in learning ICT integration. According to Tosuntaş et al., (2019), educators' knowledge, skills, attitudes, beliefs, and dispositions on integration should be accentuated after eradicating peripheral barriers to accomplish technology integration. ICT integration should be acclimated and converted into a philosophy rather than mechanical progression.

Inadequacies in staffing in public schools delay ICT integration

South Africa has a huge challenge of understaffing, and the Department of Basic Education does not take the necessary steps to address this issue. Eastern Cape alone has vacancies of 658 principals and 600 teachers filled by temporary and acting staff, and this creates uncertainty among education stakeholders and compromises quality education (Phandle, 2021). South Africa like any other developing country has the challenge of recruiting inexperienced educators to fill in vacant teaching posts. In that regard, the relief educators who in most cases are under pressure from time constraints, in the end, struggle to fully comprehend the content knowledge and the pedagogy for better integration with ICT. Adequate comprehension of content knowledge and the pedagogy enables smooth integration of ICT as digital content will only have to come to present the knowledge in a way that would make learning enjoyable. ICT enables learning to take place outside the formal learning environments, providing the anticipated outcomes either in the presence or absence of the educator. Informed by the history of the South African education system, the digital divide still exists where previously disadvantaged schools still face the limitations of ICT resources hampering them from integrating ICT into their educational activities (Mukhari, 2016, Mooketsi & Chigona 2014). However, the availability of resources does not equate to improved integration of ICT in education activities.

Technology Organisation Environment model

Technology Organisation Environment (TOE) grounded the study on examining the barrier to integrate ICT integration for teaching and learning in schools. Figure 1 below shows the TOE model developed by Tornatzky and Fleisher (1990) who propose that innovation in environments is based on three contexts, namely, the technology context, organisational context, and environmental context. Technological context describes the interior, in addition to peripheral, technologies of importance to the enterprise. These consist of current core practices of the enterprise, as well as technologies accessible but external to the firm. Organisational context is about variables that describe an organisation, such as the scope, size, and managerial culture. These include the availability of resources and human resources quality. The organisation is a rich source of formal and informal structures, processes, and cultural qualities that guide the innovation adoption process (Tornatzky & Fleischer, 1990). Environmental context refers to the surroundings in which the enterprise operates and includes the competitors, access to resources, and the legal, regulatory and governmental influence (Tornatzky & Fleischer, 1990; Haag & Eckhardt, 2014).

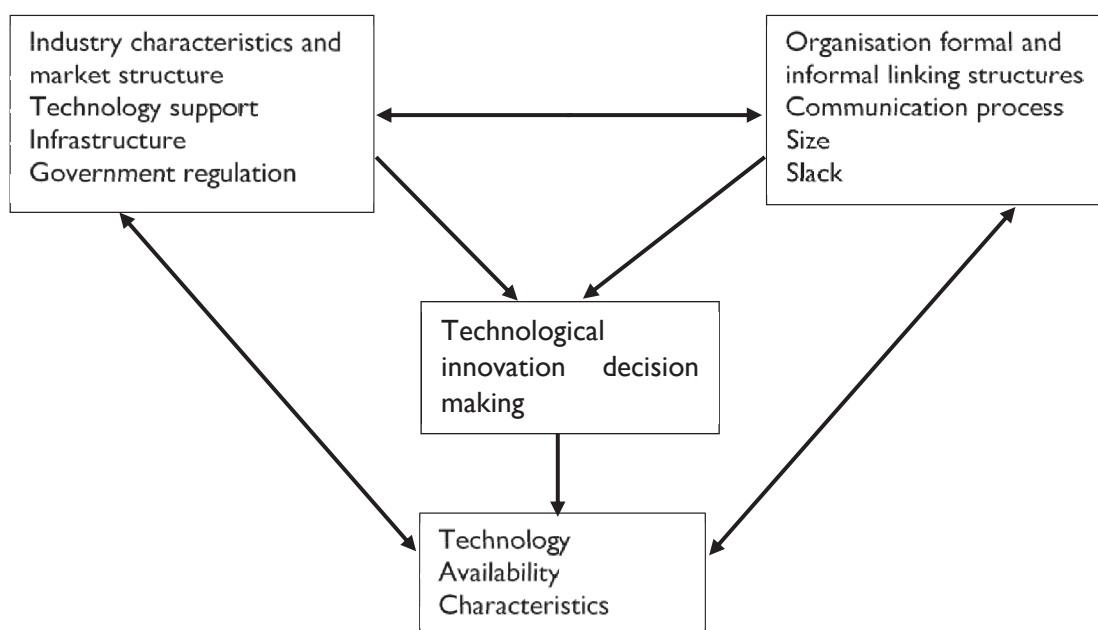


Figure 2: *Technology, Organisation, and Environment Framework, Source: Tornatzky and Fleisher (1990, 79)*

Figure 2, displays Technology, Organisation, and Environment Framework of Tornatzky and Fleisher (1990, 79). The constructs in the framework may vary across different studies, however, the selected TOE framework provides a good theoretical basis to examine the ‘barrier to sustainable integration of ICT in Pietermaritzburg public secondary schools using the Exploratory Sequential Mixed Methods’. The theory argues that internal and external forces pose barrier to organisational innovation (Tornatzky & Fleisher, 1990).

Research Methods

The study is premised within the pragmatism paradigm and uses exploratory sequential mixed methods design. Qualitative data was collected from qualitative interviews. Interviewees were purposively selected from public schools around Pietermaritzburg in KwaZulu-Natal. The participants comprised 20 teachers who registered and attended their honours degrees in education. In addition, data was collected using in-depth interviews. Audio recordings were used and subsequently transcribed. Transcription involved careful listening to the audio recording and getting closer to the data. Accuracy was enforced by listening to the audio recording several times, this also enabled a better understanding of each participant’s experiences and challenges in ICT integration in their teaching. Transcribing and listening also necessitated further interrogations on the phenomenon.

In terms of trustworthiness, a scenario where the research embodies the participant views accurately, (Lietz and Zayas 2010; Guba and Lincoln 1981), the study attempted to accurately decode the messages from the participants. The continuous contact of the researchers with the interview transcripts as well as member checking were all attempts to ensure as accurate a transcription (and subsequent interpretation as possible). Some of the strategies suggested to achieve trustworthiness include audibility, credibility, confirmability, and transferability (Lietz and Zayas 2010, Kiyuni and Kivunja 2017). Credibility reduces the possibility of bias and research reactivity. In the same vein, a non-intrusive audio recorder which was later used for the transcription was employed to capture the views accurately. This was done after consent for the recording was sought and granted through a consent form. The researcher also reduced researcher bias by engaging in reflexivity (Drisko 1997), where their biases were identified upfront. On ethical issues, which refer to principled sensitivity to the rights of others (Cohen Manion and Morrison 2011), this research observed the informed consent of the participants through their signing consent forms. Permission was sought from the gatekeepers including the KwaZulu Natal Department of Education and the school principals before the study was conducted. Gatekeepers’ letters were also sought from the university to which the researchers and students belong. We obtained an ethical clearance letter from Durban University of Technology.

Findings

The themes were extracted through a detailed systematic qualitative analysis of the transcripts, which were read and examined several times, annotating the text with initial comments. Meaningful theme clustering was then done by identifying connections between them and developing overall themes. Data was coded, and patterns were identified to derive themes. The research framework proved to be useful as indeed results on the barriers fall into different categories. Some of the barriers to ICT integration emanated from

within the education structures and some barriers from outside the education structures, also, the technology itself posed some barriers to its adoption. The results are categorised into technological factors, organisational factors, and environmental factors.

Technological pedagogical content knowledge

Some interviewees felt that although they were computer literate, they failed to integrate ICT into teaching and learning processes effectively. This study is in line with Nkadameng and Thaba-Nkadamene (2019) who found that some teachers in rural Limpopo schools are computer illiterate and had never used computers before. Integrating ICT in teaching and learning requires technological knowledge and skills, and an understanding of when, and how to infuse ICT during content delivery (Nowfeek & Mahrool, 2021). According to the literature, these skills are critical as they can be the biggest barrier to ICT integration (Hew & Brush, 2007). According to Wachira & Keengwe (2011), educators would shy away from using ICT in teaching and learning due to the insecurity that lack of skills brings. This was echoed in the teacher's voice below.

Teacher 10: *After I arrived from Country A outside South Africa I was identified to join the content workshops by CASME (an NGO specializing in Mathematics Education). This assisted me in knowing the Indian Mathematics package for use in Mathematics. Further, as a Dinaledi School, the principal sends me to workshops to understand the mathematics content. Later we were able to afford two laptops and two projectors.*

Teacher 18: *The principal was very protective of laptops, projectors, and Wi-Fi instead of encouraging teachers to use them, he put them in the strong room. The adoption of ICT needs encouragement to use available gadgets by the principal.*

The study found that educators lack basic ICT knowledge hindering them from performing basic ICT operations and aligning their teaching and learning with technologies (Ramafi, 2022, Nkadameng, 2022) ICT literacy levels are generally too low, contributing to limited interest and use of the technologies in their teaching and learning. One quote from interviews suggested the same as follows

Teacher 3: *Using ICTs in my school is hindered not by the availability of gadgets as we have a fully equipped computer laboratory donated by the company ESKOM which supported the school with 3 Gigabytes of data as early as in 2007. I then downloaded and shared question papers from the National Department of Education with learners and other teachers. I used USBs for future reference. I also created emails for teachers including the principal.*

This quote suggests that digital literacy is a serious barrier preventing schools from adopting ICTs in schools around Pietermaritzburg. Although the pedagogical benefits of ICT adoption are vast, its integration is "often neglected (Faloye, & Faniran, 2023).

High ICT infrastructure support costs, ICT resource constraints, and fragmentation of ICT provisioning

Principals said that the costs of maintaining the computers and related hardware and software were beyond their budgets. Hiring ICT technicians to fix broken is expensive. Installation and maintaining updated software such as anti-virus are expensive for the schools.

Teacher 15: *The principal accused the KZN DoE of not giving enough support to the computer laboratory. He was left with the task of hiring educators to double up as computer technicians, otherwise the computer labs were not useful. There was restricted access to the improvised computer lab. On more than two occasions, I was woken up by the security guard to attend to burglaries by the community members attempting to steal the computers, entering through the roof of the classes. Cases would be opened but the efforts always resulted in naught.*

This finding aligns with Naicker (2013) who identified the school's challenges in purchasing, maintaining, and supporting computers due to budget constraints. Teach Educator (2025, par 3) highlights that "budget constraints can lead to a lack of resources, outdated equipment, insufficient staff, and limited access to educational materials".

There is a lack of ICT resources and access in the schools, these range from teaching and learning software to hardware to data constraints. Schools are left to make decisions regarding the acquisition of computer-related hardware and software. In addition, schools must tap out of their limited budgets in purchasing these resources. Resultantly, schools do not prioritise ICT infrastructure but rather other operational costs. During the COVID-19 pandemic, educators could not access platforms specifically designed for teaching and learning such as Moodle and Microsoft Teams. Due to the unavailability of proper teaching and learning platforms, WhatsApp became the only platform available to communicate with learners, provide content notes, and assignments, and provide feedback. Educators expressed concerns about communicating with learners, they would use their smartphones and data. Schools and the Department of Basic Education do not provide data and ICT devices for teaching and learning. Furthermore, concerns were raised that most learners come from poor backgrounds and cannot afford devices and data, especially with the financial burdens fueled by the COVID-19 lockdowns.

Teacher 5: *The school lacks computers or laptops. The only laps available are for administration purposes. I am still subjecting my learners to chalkboard classes and homework activities.*

Teacher 9: *The school has only 3 laptops allocated for 24 teachers. It is not possible to teach with a laptop. I use a laptop for tests only. And the school has no internet connection of Wi-Fi.*

Principals indicated that there are various problems, these originate from the fragmentation in the implementation process. Although stakeholders are involved, they do not have a common area of convergence. There are gaps in strategies and policies resulting in integration problems.

Resistance to change

Some interviewees reported that technologies face resistance from experienced educators who are used to the traditional ways of teaching and learning. Integration of ICTs in teaching and learning is viewed as an extra burden to acquire techno-pedagogical skills in addition to using ICT during teaching. Resistance to change has blocked the realisation of ICT integration initiatives.

Teacher 2: I am working with experienced teachers who are closer to retirement. And they do not want anything that uses technology for teaching and learning. They cannot use computers. Unfortunately, we still have colleagues in basic education who think computers have difficult operations that need thorough training.

In the related study by Ramafi (2022) teachers' attitude was found to influence non-compliance and resistance to change in adopting technology for teaching.

Ramafi, P. (2022, December). Investigating the barriers of ICT use in teaching and learning at public schools in South Africa. In *International Conference on Intelligent and Innovative Computing Applications* (pp. 92-102).

Theft and vandalization of Computers and related equipment

Most principals and educators reported that burglary and theft robbed them of their ICT equipment and infrastructure. The school communities pose a big risk of being attacked by robbers when they try to help. Sometimes some community members often broke into the schools and stole ICT equipment.

Teacher 8: Computers, laptops, projectors, and other school electronics are targets for thieves. The schools have built strong rooms, but during storms and heavy rains, however, thieves use strong cutting systems to access the strong rooms. Our school was targeted yearly, during heavy storms. The school loses all its E-tech in each stealing event.

Teacher 1: Our school is next to the main road to government offices, and the school is affected by the masses of protesting people. Sometimes they break into the school premises destroying property and stealing.

Apart from theft, there is also school vandalism caused by learners and sometimes by community members during service delivery protests. Teachers reported various cases of vandalism to the ICT and related equipment by learners and some community members. In most instances computer labs would be burnt for no apparent reason, demonstrating criminal elements at work. Some principals highlighted that some forces of destruction emanated from within the schools, while some were outside forces.

Theft and vandalization of computers and related equipment by South African school stakeholders is common during service delivery protests. Phahlamohlaka and Lotriet (2002: 283) identified a "disturbing trend of computer hardware theft emerging from several rural communities" in the early 2020s. The challenge of theft and vandalism of school property including ICT infrastructure is a current phenomenon, and common among South African schools, however, there is scanty of such literature.

Discussion

The findings of this study reveal a range of barriers to ICT integration in teaching and learning, categorized under technological, organizational, and environmental factors. These challenges highlight the complexities of ICT adoption in South African schools and the multi-faceted nature of the issues at play.

Firstly, a lack of technological pedagogical content knowledge is ICT integration barrier in South African schools. A significant barrier identified is the lack of technological pedagogical content knowledge among teachers. While some educators are computer literate, they lack the skills to integrate ICT effectively into their teaching. This aligns with the findings of Nkadimeng and Thaba-Nkadimene (2019), who reported that teachers in rural Limpopo schools lacked computer literacy. As Wachira & Keengwe (2011) noted educators often shy away from using ICT due to a lack of confidence and skills. Teacher testimonials further reinforced this challenge, highlighting that while ICT infrastructure was available in some schools, lack of skills and leadership support limited its effective use.

Secondly, high ICT infrastructure support costs and resource constraints were identified as ICT integration challenge. The financial burden of maintaining and supporting ICT infrastructure is a major barrier. Schools face budget constraints, making it difficult to hire ICT technicians, maintain software updates, and secure equipment from theft and vandalism. This challenge is consistent with Naicker (2013), who identified budget constraints as a critical issue limiting ICT adoption. The study also found that while some schools had received ICT donations, the lack of ongoing support rendered these resources underutilized. Additionally, the COVID-19 pandemic exposed the shortcomings of ICT integration, as educators relied on informal platforms such as WhatsApp due to the unavailability of proper e-learning platforms.

Thirdly, resistance to change and use ITC was a barrier. Resistance from experienced educators was another key finding. Some educators, particularly those nearing retirement, were unwilling to embrace ICT integration, perceiving it as an additional burden.

This aligns with Ramafi (2022), who found that teachers' attitudes significantly influence non-compliance and resistance to ICT adoption. The perception that ICT use requires extensive training further discourages teachers from adopting new technologies.

Finally, theft and vandalization of ICT equipment were found to be an escalating trend in South African schools. The study found that theft and vandalism of ICT equipment are prevalent in many South African schools. Principals and teachers reported that schools were frequent targets of theft, often losing entire ICT labs. Community-related factors, including protests and criminal activities, exacerbate the problem, as identified by Phahlamohlaka and Lotriet (2002). Schools often struggle to secure their ICT resources, making it difficult to maintain technology-driven learning environments.

Conclusion

The integration of ICT in education is hindered by multiple interrelated barriers, including inadequate teacher digital training, financial constraints, resistance to change, and external environmental threats such as theft and vandalism. While some schools have received ICT resources, their effective utilization remains limited due to a lack of strategic implementation and ongoing support. The findings align with existing literature on ICT challenges in education, reinforcing the need for a comprehensive approach to ICT adoption in South African schools.

By addressing these barriers systematically, South African schools can move towards effective ICT integration, enhancing teaching and learning outcomes while overcoming existing challenges:

- i. Capacity building and teacher training should be prioritised. Schools and educational authorities should prioritize ICT training programs to equip teachers with technological pedagogical content knowledge. Continuous professional development should be mandated to ensure educators can integrate ICT effectively into their teaching practices (Nowfeek & Mahrool, 2021).
- ii. Financial and technical support by the Department is a requirement. The government should allocate dedicated budgets for ICT infrastructure maintenance and technical support. Partnerships with private sector stakeholders could provide additional funding and expertise (Teach Educator, 2025).
- iii. Department and school principals should encourage ICT usage. School principals should promote and facilitate ICT integration by ensuring that available ICT resources are accessible to educators. This includes establishing policies that encourage teachers to use existing technologies in their teaching (Faloye & Faniran, 2023).
- iv. Teachers should be helped in addressing resistance to change. Awareness campaigns and mentorship programs should be introduced to assist older educators in adapting to ICT use. Providing incentives for teachers who successfully integrate ICT into their teaching could encourage adoption.
- v. Schools and school communities should enhance ICT security measures. Schools should invest in security measures such as surveillance cameras, alarm systems, and reinforced storage facilities to prevent theft and vandalism of ICT equipment. Community engagement programs should also be introduced to promote a sense of ownership and responsibility for protecting school property.
- vi. The schools should be educational sites that prioritize bridging the Digital Divide. The government should ensure equitable distribution of ICT resources, including providing internet access and affordable data for teachers and students. Policies should be developed to ensure that no learner is disadvantaged due to financial constraints.

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