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Effectiveness of school managers' technology integration in senior high school management in Ghana

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Abstract
This study assessed the effectiveness of school managers' technology integration in school management in Senior High School (SHS), Ghana. Exploratory case study design was employed. Multi-stage sampling technique was used to select ten managers from some selected SHSs in Ghana. Data was analysed using thematically and results reported through a narrative that incorporated themes and subthemes. The study revealed that school managers extensively use ICT tools across five key areas: communication and collaboration, teaching and learning support, data management and record-keeping, financial and management processes, and library and information management. However, the study revealed that, effective use of these tools depends on teacher competency, institutional policies, and access to technology. Also, the results showed that technology integration in school management had significantly improved management efficiency, teaching-learning, financial management, and communication. To this end, time-saving and reduced paperwork, accurate data records and informed decision-making, effective communication, reduced workforce and increased efficiency, and precise financial records were perceived as the five key themes that characterise the introduction of the ICT in school management. Finally, challenges of infrastructure/resource limitations, internet connectivity, financial constraints, lack of technical support, user-related challenges, and software/system compatibility were identified barriers to management efficiency, teaching-learning outcomes in the study.

INTRODUCTION

Information and communication technology (ICT) has become vital across various sectors, especially education, where it transforms management, teaching, and learning. It supports data storage, knowledge management, and decision-making, making its integration in schools essential. The use of ICT in school management is increasingly popular for improving operations and boosting efficiency (Asomah et al., 2024; Ukanwa & Chiemeka, 2021). ICT includes technologies that enable digital interaction, such as computers, the Internet, telephony, and broadcasting tools (TechTarget, 2017). Its integration into education is now a global priority. Law (2008), cited in Abella et al. (2023),

studied ICT policies in 22 countries and found a shared commitment to adoption. Several African nations like Nigeria, Kenya, and Ghana have created ICT policies for education (Republic of Nigeria, 2004 cited in Ukpoma, 2019; MoE cited in Makewa et al., 2013; Republic of Ghana/MoE, 2015).

Ghana's 2015 ICT policy promotes integrating ICT into education management through strategies like ICT-driven systems, institutional capacity building, and staff training. Yalley (2022) identified challenges among pre-tertiary school managers in Birim Central Municipality, including limited knowledge, low confidence, inadequate training, and poor infrastructure, but did not assess ICT tools' effectiveness in school management. Similarly, Adebi-Caesar (2012) found barriers like insufficient teacher training and equipment, focusing on teaching rather than management. UNESCO (2005) and Makewa et al. (2013) note school management includes instructional supervision, parent involvement, and management tasks. Assessing ICT policy implementation is vital, as effective policies support school management (World Bank, 2020). Thus, a study purposed to assess the effectiveness of school managers' technology integration in school management in Senior High School in Ghana cannot be over-emphasized.

Statement of the Problem

Although Ghana has a national policy to promote ICT integration in schools, research by Ibrahim, et al. (2022) in the Sagnerigu Municipality reveals that these policies are not implemented at the senior high school (SHS) level. This raises concerns about whether managers, such as those in the Awutu-Senya East Municipality, particularly Odupong Community SHS, are effectively integrating ICT into school management. Similarly, Salifu and Yelkpieri (2024) found that despite adequate digital infrastructure, SHS managers in Tamale Metropolis lacked the ICT skills necessary for effective integration. Studies on SHSs (Atambeogo, 2020; Yalley, 2022) highlighted similar challenges such as inadequate ICT facilities and insufficient staff training, which adversely impact effective ICT integration.

While several studies highlight ICT integration in specific areas, little is known about its effectiveness in the Awutu-Senya East municipality, especially at Odupong Community SHS. Following Adebi-Caesar's (2012) call for further research in other districts, this study examines how effectively managers integrate ICT into school management at Odupong. Additionally, with the rising enrollment in secondary schools, management has become more complex, requiring greater managerial effort (Oyedemi, 2015). In Ghana, larger school populations have further intensified the challenges of effective ICT integration. By investigating how effectively managers integrate ICT in the management of SHSs is crucial for informed decision-making and to bridge the knowledge gaps. The study was guided by three research questions as follows:

1. What ICT tools used by are used by the management of Senior High school in Ghana?
2. To what extent are ICT tools used by the management of Senior High school they in Ghana?
3. What are staff perceptions of the effectiveness of ICT tools in school management?
4. What challenges do school managers and staff face in integrating ICT in school management?

LITERATURE REVIEW

Everett M. Rogers' Diffusion of Innovations (DOI) Theory underpinned this study. The theory explores how technology is adopted in education. Focused on the "effectiveness of school managers' ICT integration in school management," it uses DOI to explain how innovations spread within a group (Sahin, 2006; Corporate Finance Institute, n.d.). Rogers (2003, cited in Garcia-Aviles, 2020; Sahin, 2006) defines an innovation as any idea or product perceived as new by its adopters. Here, innovations

include computers, printers, scanners, photocopiers, Learning Management Systems, School Management Software, WhatsApp, and Email. Diffusion theory explains how innovation spreads through channels over time within a social system. It involves four components: innovation, communication channels, the social system, and time. Communication includes channels, communicators, and the innovation being shared (Rogers, 2003; Sahin, 2006). In the context of this study, interpersonal interactions act as communication channels, with staff as communicators. The school's hierarchy—headmaster, assistant headmaster, department heads, teachers, staff, and students—shapes interactions and influences diffusion. The headmaster's ICT-related decisions drive adoption among staff, facilitating integration. Innovation adoption occurs over time, reinforcing the theory's time dimension (Sahin, 2006).

One objective of this study was to assess the ICT tools usage at the SHS level and their extent of use. It is therefore necessary to get acquainted with some ICT tools generally used in schools to understand what pertains to our chosen school. ICT tools like computers in the context of this study references (desktops and laptops), printers, scanners, photocopiers, projectors, televisions and interactive whiteboards as employed on daily basis by the management of High School. There are other aspects of ICT which are not readily visible. These include LMS, School Management Software (Asomah et al., 2022; Bouchrika, 2024), Microsoft Office Suite, the internet, websites, video-conferencing tools, attendance tracking software, accounting software, human resource management software and so on. ICT tools in education can generally be divided into two main categories: hardware and software. Hardware tools are devices such as computers, tablets, projectors, interactive whiteboards and audiovisual equipment, which are the primary infrastructure for integrating technology into the classroom (Allen, 2023). In contrast, software tools are applications, programs, and platforms that enhance educational activities and help achieve learning objectives. These include educational apps, LMS, virtual reality (VR) simulations, software for content creation and assessment, video conferencing tools, and online collaboration platforms (Brown, 2023). These also include school management software (SMS), a digital platform designed to help academic institutions efficiently manage their operational and management tasks.

Further, this study examines the use and impact of ICT tools in Senior High Schools (SHSs), highlighting their role in management and teaching. As technology becomes central to education, it enhances communication, administration, and remote learning, especially during crises like COVID-19 (UNICEF, 2020a). ICT supports informed decision-making, connects schools with global trends (Asomah et al., 2022), and makes learning more interactive and aligned with student interests (Heafner, 2004). It fosters digital literacy, problem-solving skills (UNESCO, 2022), and creativity over rote learning (MoE, 2015), promoting a student-centered, inquiry-based approach (Iskrenovic-Momcilovic, 2018). TV-based learning also ensured broader access during the pandemic (UNESCO, 2022). Also, integrating ICT into school management enhances efficiency, reduces paperwork, and improves decision-making. Automating tasks like student records, attendance, and communication boosts accuracy and streamlines operations (Orhani et al., 2024). Tools such as Google Docs, Dropbox, and OneDrive lower management costs, while scanned documents increase accessibility. Communication platforms like email, WhatsApp, and online forms simplify data collection and speed up responses (Asomah et al., 2022; Erdem, 2023). ICT ensures precise record-keeping for exams and attendance, supporting better resource allocation (Orhani et al., 2024). Systems like EMIS, especially with AI integration, aid policymaking and monitoring (UNESCO, 2022). However, research in Ghanaian SHSs remains limited.

Integrating ICT into education in Ghana faces significant challenges. A major issue is inadequate teacher training, leaving many educators unprepared and lacking confidence in using

technology (Asomah et al., 2022; Adebi-Caesar, 2012; Saha, 2023). Carstens et al. (2021) highlight that both teachers and students need ICT skills, but teachers often lack time and support. School leaders also find ICT implementation overwhelming (Mogwe & Balotlegi, 2020). Infrastructural problems further hinder progress, with many schools lacking classrooms, electricity, and internet access (Hennessy et al., 2010; Kundu & Bej, 2021). Frequent power outages and equipment failures worsen the situation (Abdulrahim & Bolaji, 2024; UNESCO, 2022). Also, resistance to change is a major challenge to ICT adoption in schools. Many managers limit ICT use to certain subjects and favor traditional assessments (Amenyedzi et al., 2011; Yalley, 2022). In Ghana and Nigeria, fear of technology and reluctance to adopt new methods cause delays (Abdulrahim & Bolaji, 2024). Weak leadership, policy gaps—with only 7.9% of Ghanaian schools having ICT policies (Ibrahim et al., 2022)—and time constraints also hinder progress. Financial challenges, staff turnover, and poor collaboration worsen the situation (Bon, 2010, cited in Yalley, 2022). Experts stress strategic planning and affordable solutions like Open Educational Resources (UNESCO; Citi Newsroom, 2020).

METHODS

Research Design

An exploratory case study design was used in exploring the effectiveness of school managers' technology integration in school management within a single institution. This design allowed an in-depth study, and was considered suitable for school for deeper exploration of the practices, viewpoints, and challenges of ICT integration into school management (Creswell & Poth, 2018). This was necessary for understanding complex situations in a school setting.

Population, Sample and Sampling Techniques

The study was conducted in the Awutu-Senya East Municipality in Ghana's Central Region, focusing on 100 school staff members (65 males, 35 females), including teachers, management staff, and the head. A sample of 10 participants was selected using a multi-stage sampling technique, with participants drawn from four groups: top management (headmaster and assistant), management staff (accountant, secretary, librarian), department heads, and teachers. Purposive sampling was used for the headmaster, assistant, key management staff, and ICT head due to their roles in ICT decisions. Department heads were selected randomly for fairness, while two teachers were chosen using systematic sampling for simplicity. This combination of purposive, random, and systematic sampling methods ensured a diverse sample, effectively supporting the study's goals of exploring ICT integration.

Data Collection Methods and Analysis

Open-ended questionnaire administered to respondents consisted of four sections: Section A collected biographic data (7 questions), while Sections B to D addressed the study's objectives with 33 questions. Subsection 1 contained general questions, and subsections 2 to 7 focused on ICT integration in student, personnel, financial, and general management, instructional supervision, and community engagement. Open-ended items enabled respondents to share their views, practices, experiences, and challenges regarding ICT tools in schools. This approach aligned with the qualitative nature of the study, providing detailed insights into ICT integration in school management (Houston, 2024; Netizen Experience, 2023). The qualitative data from open-ended items were analysed thematically to examine participants' views on ICT integration in school management (Nowell et al., 2017). Researchers analyzed responses, identified themes, and assigned codes to key ideas. These codes were grouped, forming patterns aligned with research questions, then reviewed, named, and reported narratively with themes and subthemes (Naeem et al., 2023).

Ethical Considerations Data Collection Procedure

Ethical clearance was obtained from the University of Education, Winneba, Ghana and the Municipal Education Directorates. Following the authorization, two of the researchers went to field to collect data. Respondents consented and were informed that they could withdraw from the data collection process at any time. Paper form of instruments was distributed to respondents to answer. A week later, schools were visited and completed surveys collected.

RESULTS AND DISCUSSION

Respondents' characteristics

The study gathered essential data from 10 participants, focusing on their characteristics: age, education, job roles, experience, and ICT proficiency. Identities were kept confidential. As shown in Table 1, 40% of participants were aged 31-40, 50% were 41-50, and 10% were 51 or older. Educationally, 50% held first degrees, and 50% held second degrees. Regarding teaching experience, 90% had worked at SHS for 5-10 years, while 10% had 11-15 years of experience. ICT proficiency levels varied, with 70% at an intermediate level and 30% at an advanced level. This data provides valuable insight into the demographics and professional background of the participants.

Research Question 1: What ICT tools used by are used by the management of Senior High school in Ghana? The question examined how ICT tools are used in school management across five key areas: Communication and collaboration, teaching and learning support, data management, financial and management processes, and library services.

Communication and collaboration stood out as a major use, with platforms like WhatsApp, email, and Zoom enhancing interactions among staff, students, and parents. Public address systems and sirens were also used. Additionally, tools like Google Classroom and Moodle supported digital learning and resource sharing, improving overall school management. The participants' responses are as follows:

HOD 2: "…Smartphones with WhatsApp platforms are created to send parents information." Headmaster 1 added that "apps like WhatsApp, zoom etc facilitate communication, collaboration and information sharing among staff. yes, messaging and notification tools such as e-mail, newsletter, mobile phone, SMS, and voice messages facilitate communication between schools and parents. For example, automated messaging system sends an important updates and reminder to parents.''

LIBRARIAN also added that, "it aids us to communicate with the library prefects via text (SMS) to collect overdue books." The Secretary asserted that, "group chats and mails make information circulate faster among staff."

Teacher 2 also said that, "information is given on staff WhatsApp platforms on our various smart phones for easy access." The Accountant, moreover asserted that, "through a Microsoft, a communication and collaboration platform for teachers and students to share resources, discuss topics and work on projects etc. there many software like smart board, google classroom etc."

These responses illustrate the importance of these tools in communication. Public address systems and sirens are also used for important announcements within the school environment. Additionally, tools like Google Classroom and Moodle assist in coordinating lesson plans, sharing educational resources, and engaging students in a digital learning environment. To keep parents and the community informed, messaging and notification systems such as newsletters, voice messages, and social media platforms are commonly used.

Research Question 2: To what extent are ICT tools used by the management of Senior High school they in Ghana?

Teaching and learning support

The study indicates that ICT is critical in teaching and learning support. ICT tools like laptops, projectors, and Bluetooth speakers enhance classroom interaction and lesson delivery. PowerPoint and Google Workplace tools improve digital literacy for teachers and students, and are frequently used in professional development workshops to enhance teaching methods.

The respondents had this to say:

HOD 1: "laptops and projectors are used. They are always used for presentations. The computers are used to keep staff records and schedules."

HOD 2: "PowerPoints and Google workplace(slides). These are used during workshops for training staff and one there is a workshop, they are used."

HEADMASTER 1: Google classroom-integrates google drive, docs, and sheets for seamless. Moodle- offers a range of collaborative tools including forum, group assignments.

ASSISTANT HEAD: "facilitate teaching and learning making lesson delivery interesting. laptops and projectors are used to present lessons in classrooms."

TEACHER 2: "laptop computers and projectors are used to deliver lessons and give assessment but not used to monitor. laptop computers, projectors, and Bluetooth sound speakers. These help me to show video lessons to my students."

TEACHER 1: "during class presentations, ICT tools like the laptop, projectors are used in my presentations even the slides are given to students through google drive."

Data Management and Record-Keeping

Schools use systems like SIS and MIS to manage student and staff records. Tools such as desktop computers, accounting software, and Excel track performance, generate reports, and maintain secure financial documentation. Participants had this to asserts that:

"By the use of SIS (Students Information System) are used to keep students' attendance ad also their report cards are filled for them. SIS are used to keep their reports also excel is used to record and keep their exercise" (HOD 2)

"Through student information system (SIS), the site or platform store and manage student data including grades, attendance, demographics, transcripts etc. (HEADMASTER 2)

"I use ICT tools like mobile phone and laptop to upload students records in the student information system portal (SIS). Yes, desktop computers are used to permit stall document and for staff training during PLC meetings." (TEACHER 2)

"Digital storage securely stores student records, reducing physical storage needs and learning management unit track student progress, assignment and grades. google forms are used for creating online forms and surveys for staff record keeping. yes, Ghana Education Service Management Information system is used to manage staff records whole digital literacy is also used to train staff etc and all are user friendly" (HEAD MASTER 1)

"I normally used to excel to keep my students' records, attendance tracking and performance" (HOD 1)

"They help in keeping track of students' records and keep safe their records." (ACCOUNTANT)

"The GESMIS which was recently introduced by GES enables the school keep records of all staff particulars electronically." (SECRETARY)

Financial and Management processes

ICT tools like Microsoft Excel, budgeting, and accounting software help manage school finances, payroll, and reporting. Digital wallets, procurement platforms, and desktop computers improve inventory tracking, procurement, and management efficiency in schools.

"It is real time financial reporting. Digital audit trials. It is also automated financial tracking" (ACCOUNTANT)

"Not really, I used word and excel sheet on the phone to prepare financial report yes, desktop computers are connected to the internet for procurement activities. computers are used to organised staff list and print records." (TEACHER 2).

"Accurate record keeping of school financial statements are visible to the staff." (SECRETARY)

"It makes organizations or financial management to make informal decisions and maintain accountability. Through school management system and teacher scheduling software." (HEADMASTER 1)

"Spreadsheet, accounting software they aid in creating financial transactions create budgets also financial reporting process, improve accuracy, and enhance decision-making. Spreadsheet are even used to take inventory. It helps to organize the staff meeting through WhatsApp and other social." (HOD 2)

Library and information management

ICT tools in school libraries, like desktop computers and digital displays, help manage book records, track borrowed materials, and organize resources, offering a more structured, accessible system than relying on printed materials. The respondents had this to assert.

"Desktop computer for updating records on books borrowed and book returned. Desktop computer is used almost all the time to enter book borrowed and returned. To clearly show when books are borrowed, due returned date." (LIBRARIAN).

"Through electronic displays showcase called digital signage to announce events and information. Through google calendar and through student information system." (HEADMASTER 1)

Research Question 3: What are staff perceptions of the effectiveness of ICT tools in school management? The integration of ICT tools in school management makes management procedures efficient, and teaching and learning effective. This report presents an analysis of staff perceptions regarding the effectiveness of ICT tools in school management within the Awutu-Senya East Municipality. The findings are categorized under five key themes and discusses as follows.

Time Saving and Reduced Paperwork

ICT tools have reduced reliance on traditional paperwork, boosting efficiency. Tools like Google Forms streamline staff record-keeping and surveys. Teachers can digitally store lesson materials, minimizing handwritten notes. Projectors and slides enhance lesson delivery, while ICT simplifies management tasks, cutting time spent on repetitive duties. Responses from Staff are as follows:

"*It helps in record-keeping and disseminating information.*" *(HOD 1)*

"It makes work easier and enhances research work." (HOD 1)

"ICT integration has made teaching and learning very easy." (HOD 2)

"It helps reduce the traditional use of paperwork, improves data management, and aids communication." (HOD 1)

"ICT tools aid in planning lessons instead of paper and pen, and projectors are used for better visual aids." (HOD 1)

"Lecture notes are not written anymore since students are supplied with slides via Google Drive." (TEACHER 2).

Accurate Data Records and Informed Decision-Making

ICT tools enhance data accuracy in schools by simplifying management of student records, attendance, and performance. Tools like Microsoft Excel and GESMIS ensure secure, accessible data for informed decision-making in school operations. Responses from Staff are as follows;

"*ICT tools help in keeping track of students' records and keep them safe.*" *(HOD 1)*

"*I normally use Excel to keep my students' records, track attendance, and assess performance.*" *(HOD 3)*

"*GESMIS, recently introduced by GES, enables the school to keep electronic records of all staff particulars.*" *(SECRETARY)*

"*ICT integration has transformed the way we work, making it more efficient, productive, and convenient.*" *(TEACHER 2)*

"*It makes it easy to identify students who are not performing well and take immediate action.*" *(TEACHER 1)*

Effective Communication

ICT tools like emails, WhatsApp, and SMS enhance communication between teachers, students, parents, and school managers. They enable prompt updates on academic performance and foster collaboration, while also supporting staff development and teamwork efficiency. Responses from Staff are:

"*They help us send and receive information to and from parents.*" *(HOD 1)*

"*We normally discuss some issues on other social platforms like WhatsApp.*" *(HOD 3)*

"*Parents are sent messages on their phones through phone calls or SMS.*" *(HOD 1)*

"*WhatsApp platforms are used to interact with students and parents.*" *(TEACHER 1)*

"*Through online surveys, parent portals, and WhatsApp, we communicate with parents.*" *(HEADMASTER)*

"*Emails, newsletters, and mobile apps are used to send updates and reminders to parents.*" *(SECRETARY)*

"*Parents who cannot write use voice notes to communicate on WhatsApp.*" *(HOD 2)*

Reduced Workforce and Increased Efficiency

ICT tools have streamlined school operations, enabling efficient lesson planning, material sharing, and online assessments. Digital storage and LMS reduce physical storage while ensuring security. Remote work enhances work-life balance, though technical issues and insufficient training limit effectiveness for some staff. Responses from Staff are below:

"ICT tools enable staff to work remotely, allowing flexibility and improving work-life balance." (ACCOUNTANT)

"They make administration easier, and messages are sent to the appropriate quarters on time." (HOD 1)

"Teachers cover more topics per semester and can easily share ideas with each other." (ASSISTANT HEAD)

"Projectors and slides make lesson delivery easier and require less energy from the instructor." (TEACHER 1)

"ICT tools enhance operational efficiency and data-driven decision-making." (SECRETARY)

"Staff can easily respond to emails from the head office and prepare lesson plans efficiently." (TEACHER 1)

Accurate Financial Records

ICT tools have improved school financial management through digital tracking, accurate reports, and automated audits. Despite benefits, challenges like high software costs, connectivity issues, and cybersecurity risks persist. Responses from Staff include:

"*They are used for financial record-keeping.*" *(HOD 1)*

"*ICT makes financial management more efficient, improves accuracy, and enhances productivity.*" *(HEADMASTER)*
"*It is real-time financial reporting with digital audit trails and automated financial tracking.*" *(ACCOUNTANT)*
"*Budgets and financial reports are presented using ICT tools.*" *(ASSISTANT HEAD)*
"*The cost of maintaining financial software and LMS portals is high.*" *(HOD 2)*
"*Internet connectivity issues sometimes affect financial transactions and record-keeping.*" *(TEACHER 2)*

Research Question 4: What challenges do school managers and staff face in integrating ICT into school management? The integration of ICT into school management in the municipality faces numerous challenges:

Infrastructure and Resource Limitations

A major challenge in integrating ICT into school management is the lack of infrastructure and resources. Many schools have insufficient or outdated ICT tools, and the absence of ICT labs, e-libraries, and projectors hampers effective teaching and management. Key Responses included:
"There are no enough official ICT tools in the school." (HOD 1)
"Inadequate number of ICT tools and the few ones are too old." (ASSISTANT HEAD 1)
"There are no extra classrooms anywhere in the school to fix the few ICT tools permanently for use. Moving them to and from destroys them fast." (TEACHER 2)
"The school is not having a lot of these tools in the school." (TEACHER 1)
"The library lacks e-library, projectors, and photocopiers." (LIBRARIAN)

Internet Connectivity Issues

Poor internet connectivity is another significant challenge affecting ICT integration in schools. Many schools lack internet access, which affects research, communication, and the use of online platforms for teaching and management. Weak internet signals and unstable connections hinder communication between schools, students, and parents. Key Responses are as follows;
"There is no official internet connection for official use." (HOD 1)
"Bad internet connection hinders the communication process with parents." (HEADMASTER)
"Internet signal is very weak most of the time." (LIBRARIAN)
"Lack of internet access affects research work." (HOD 1)
"Yes, internet accessibility is a major challenge." (SECRETARY).

Financial Constraints

The high cost of purchasing, maintaining, and upgrading ICT tools is a barrier to their effective use in school management. Schools often lack the necessary funds to acquire new ICT tools, repair faulty ones, or upgrade outdated systems. The cost of internet data, hardware, and software is also a major burden for both schools and parents. Key Responses include;
"Cost of managing these tools." (TEACHER 1)
"Financial barriers, such as the cost of implementing ICT tools." (HOD 1)
"Maintenance and upgrade costs." (HOD 2)
"Natural disasters like floods and earthquakes can destroy ICT tools, making replacements expensive." (HEADMASTER)
"Cost of hardware and software is a major challenge." (HEADMASTER)

Lack of Training and Technical Support

Many staff struggle with ICT integration due to insufficient training and technical support. While some are comfortable, others face challenges due to limited professional development and lack of ongoing in-service training. The respondents had this to say.

"There is no training or technical support provided by the school." (HOD 1)

"Not often and where in-service training needs to be organized, they are not often organized." (HOD 2)

"Lack of training and support." (TEACHER 2)

"The school is supportive but there are no ICT tools for training teachers." (ASSIST HEAD)

"Institutional support exists, but it should be frequent, at least once a year." (ACCOUNTANT).

User-Related Challenges

Some participants struggle with ICT tools due to low digital literacy, resistance to change, or limited access to devices. Older staff, illiterate parents, and some students face barriers to using technology. Some respondents said:

"Some of the management staff lack current skills in managing student records'' (TEACHER 1)

"Resistance to change—some staff prefer traditional methods." (ACCOUNTANT)

"Illiteracy is a big challenge, especially among parents and community members." (HOD 2)

"Some parents may not have the necessary digital knowledge to effectively use ICT tools." (SECRETARY/ HEADMASTER)

"Parents or community members may not speak or read and understand the languages available in ICT tools, creating a barrier to adoption." (HEADMASTER)

Software and System Compatibility Issues

The effectiveness of ICT tools is sometimes hindered by software-related issues, including compatibility problems, outdated software, and system crashes. Additionally, financial software may not work well with certain operating systems or browsers, making it difficult for schools to manage financial records effectively. Respondents added that;

"Incompatibility between financial software and operating systems or browsers." (HOD 2)

"Some software is not user-friendly." (HOD 3)

"Outdated hardware, compatibility issues, and integration difficulties." (ACCOUNTANT)

"Data corruption and system crashes." (LIBRARIAN/ SECRETARY)

"Corrupt files sometimes cause missing student records." (TEACHER 2)

Power Supply and Maintenance Challenges

Unstable power supply and frequent power outages disrupt ICT usage in schools. Power interruptions not only prevent schools from using ICT tools effectively but also result in data loss and system failures. Additionally, schools lack backup systems, making it difficult to retrieve lost files. Key Responses:

"Unavailability of UPS and unstable power supply." (LIBRARIAN)

"Yes, sometimes during delivery of the lesson, the light will go off. If that happens, you have to adjust your teaching in different ways." (HOD 3)

"Intermittent power outages and over-aged computers." (ASSSISTANT HEAD)

"Power interruption causes files to mix or be lost." (TEACHER 2)

"Backup is challenging—system backup has to be paid for, and if failed to pay, there is no backup." (TEACHER 2)

The above indicate that frequent power outages and unstable electricity supply disrupt ICT-based school management activities. Many schools lack backup power solutions like Uninterruptible Power Supplies (UPS), making it difficult to use digital tools during blackouts.

Discussion

On the first research question, managers enhance communication and collaboration among staff, students, and parents through digital platforms, aligning with Kimmons (2015) and Ally (2019), who highlight tools like WhatsApp, SMS, email, and Zoom for facilitating interactions and virtual meetings. Sanchez and Martinez (2018) note that public address systems and sirens remain essential for timely announcements. Chen and Looi (2019) emphasize digital tools in lesson planning, resource sharing, interactive learning, and student engagement. Tess (2017) found that newsletters and social media keep parents and communities informed, promoting transparency. Recent research by Rahman et al. (2023) confirms digital platforms support management decisions and parent-teacher collaboration. Mensah (2021) adds that multi-channel communication strengthens stakeholder engagement and improves educational outcomes, contributing to a better school environment.

Research question two revealed the significance of digital tools in enhancing teaching and learning. Kafyulilo et al. (2016) highlighted that tools like laptops, projectors, and Bluetooth speakers make lessons more engaging, while Prestridge (2017) noted their role in improving digital literacy. Lowther et al. (2008) recognized ICT's value in teacher professional development, while Ndlovu and Lawrence (2012) stressed that successful ICT integration depends on access, teacher competence, and supportive policies. Koehler and Mishra's (2009) TPACK framework underscores the integration of technology, pedagogy, and content knowledge. Teachers trained in ICT, according to Mensah (2021), are more confident in using modern methods. Digital tools also enhance data management through systems like Student Information Systems (SIS) and Management Information Systems (MIS), which improve efficiency, data security, and school operations (Abdulrahim & Bolaji, 2024). Tools like desktop computers, accounting software, and Excel facilitate performance tracking and reporting. In administration, Excel and accounting software support payroll and budgeting, while printers and photocopiers assist documentation (Miranji, 2017; Saha, 2023; Wonder, n.d.). For library management, digital systems improve access, organization, and resource tracking, further enhanced by automation and cloud storage (Rahman et al., 2023; Kumar & Sharma, 2022).

About the third research question, the integration of (ICT in school management has significantly improved efficiency by automating routine tasks such as student record management, attendance tracking, and real-time information sharing. These innovations have streamlined workflows, enhancing accuracy and organization (Orhani et al., 2024). ICT adoption reduces paperwork through digital documentation, cloud storage, and online collaboration platforms, leading to cost savings and operational efficiency (Erdem, 2023). Tools such as Google Forms, Google Docs, Dropbox, and cloud platforms streamline management tasks, save time, and minimize reliance on physical documents (Erdem, 2023; Imagina, 2024). Teachers also benefit from digital lesson planning and delivery, reducing time spent on manual methods. File-sharing platforms like Google Drive and OneDrive enhance record-keeping, collaboration, and information accessibility. Communication tools like WhatsApp and email reduce the need for printed memos. ICT tools are crucial for managing time, personnel, and finances efficiently, ensuring accuracy in records, exam data, and staff files (Orhani et al., 2024; Tulowitzki et al., 2022). Education Management Information Systems (EMIS) further strengthen decision-making, policy development, and learning assessment (UNESCO, 2022). Financial operations are supported by online payments and accounting software, promoting transparency and accuracy. Despite benefits, challenges such as software costs, connectivity issues, and cybersecurity concerns highlight the need for investment in infrastructure and training (Miranji, 2017; Adu & Olatundun, 2013). Overall, ICT integration enhances school management, communication, and educational quality.

Finally, regarding question four, ICT integration in schools faces major challenges, mainly due to inadequate infrastructure and resources. Many schools rely on outdated tools and lack essential facilities like computer labs, e-libraries, and projectors, hindering effective teaching. Without dedicated spaces, ICT equipment suffers wear and tear, while shared resources cause congestion and inefficiency. Studies by Hennessy et al. (2010), Kundu and Bej (2021), and Mingaine (2013) confirm how infrastructure gaps impede digital learning. In Nigerian private schools, Abdulrahim and Bolaji (2024) identify persistent power outages and equipment shortages. UNESCO (2022), Saha (2023), and Bećirović and Dervić (2022) also recognize infrastructure as a key barrier. Weak or absent internet connectivity further limits digital research and real-time communication. Experts recommend government-led broadband expansion, lower internet costs, and free data for educational platforms (UNESCO, 2023b). Financial constraints particularly affect schools in developing regions, where institutions struggle to afford, maintain, and update technology (Makhanu, 2010; Lomo et al., 2024). Sustainable ICT adoption requires consistent investment and cost-effective, context-appropriate solutions (Saha, 2023; UNESCO, 2023b). Disparities between wealthy and underfunded schools (Agyeman, 2021; Hertz, 2013) persist, while lack of training, digital illiteracy, resistance to change, technical issues, and cybersecurity risks further complicate integration (Mogwe & Balotlegi, 2020; Zhao & Frank, 2023; Adebayo, 2020).

CONCLUSION

The study concludes that the integration of ICT tools in school management within the Awutu-Senya East Municipality presents both opportunities and challenges. ICT tools in use include MIS, SIS, laptop and desktop computers, projectors, Microsoft Excel, accounting software, WhatsApp, Zoom, Google Classroom, and public address systems; which improve efficiency, save time, reduce paperwork, enhance communication, and streamline financial records. However, their implementation faces barriers such as poor infrastructure, weak internet connectivity, financial constraints, lack of training, and software incompatibility. Additionally, digital illiteracy among staff and parents limits their full potential.

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