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# Exploring Principal's Use and Management of Technology in Public Secondary Schools

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## ABSTRACT

This study investigated principals' self-reported technology leadership abilities in Nigerian public secondary schools. A survey was administered to a sample of one hundred principals in South-West Nigeria, using a questionnaire with a combination of both open and closed-ended questions. The survey was conducted online, and the quantitative data were obtained through the Principals' Technology Leadership Assessment Scale. The open-ended questions were examined through content analysis, and the structured questions were analysed using descriptive statistics, independent samples t-test, and ANOVA test. The results showed that the majority of the principals reported the use of technology in their schools on an average level across various domains, including leadership and vision, teaching and learning, productivity and professional practice, assessment and evaluation, support, management and operations, and social, legal, and ethical issues. Moreover, there is a notable contrast in principals' self-reported technology leadership practices based on gender, with female principals achieving higher scores in specific domains compared to male counterparts. The study also found that principals face challenges such as a lack of funding, shortage of power supply, lack of resources, infrastructure, and technical support when facilitating the use of technology in their schools. The study's findings can inform practice, and recommendations for future research are suggested.

**Keywords:** *ICT; Principals; Secondary schools; Technology leadership*

## INTRODUCTION

The outbreak of COVID-19 has dramatically accelerated the adoption of new technologies and innovation in curriculum delivery, which has become more prevalent in schools worldwide. Moreover, the evolution of the fourth Industrial Revolution has witnessed an upsurge in the use of the Internet of Things (IoT), social media, the adoption of e-learning, gamification, remote education, cloud computing, e-assessment, artificial intelligence, and various other digital technology-driven methods in almost all aspects of everyday life including instructional evaluation and delivery (Aldosari, 2020; Lucero et al., 2021; Ogwu et al., 2023). However, many developing countries, such as Nigeria, have yet to fully embrace these innovations for teaching and administration (Ogwu et al., 2023). To stay current with the use of these technological advancements in the classroom, educational institutions need to promptly adapt and incorporate them into their teaching and learning methods (Penprase, 2018).

According to Schwab & Davis (2018), the willingness of teachers to integrate technology into their teaching space is influenced by the level of administrative support they receive, which is critical in successfully deploying technology in schools. Hence, school principals must possess basic technology skills and adhere to established standards to provide adequate support and strategy for integrating technology in schools and meeting the goals of such investments (Beytekin, 2014; National Center for Education Statistics, 2003). Research indicates that school principals must act as technology leaders because they are the first administrators to initiate and execute technological transformation in schools, as an integral part of their duties as instructional leaders (Demski, 2012; Durnali, 2022). Technology leadership in schools encompasses a combination of leadership skills,

strategies, and behaviors that school principals must possess to enhance technology literacy and support teachers in integrating technology into instructional practices (Chang, 2012; Okeke & Dike, 2019). These skills are founded on the International Society for Technology in Education (ISTE) Competencies that describe specific tasks related to technology integration for school managers and include articulating a clear vision for the utilization of technology, planning for effective integration, organizing professional development programs, supporting technology infrastructure, evaluating outcomes, and staying updated on recent advancements (Chang, 2012).

In Nigeria, the Federal Ministry of Education (FME) has consistently maintained high levels of educational technology expenditure, indicating that ICT is employed in education to facilitate the attainment of national visions and sustainable development goals for education (FME, 2019). It is perceived as a mechanism for reshaping educational systems and as a way of fostering comprehensive educational frameworks. This approach involves ICT as an administrative and managerial tool, as well as support for providing on-the-job training and continuing education for teachers and educational administrators. The Federal Ministry of Education considered advancements in ICT as a means to enhance access to education through distance learning, increase the availability of quality educational materials, create a knowledge network for learners, and enhance learning and teaching quality. Although the Nigerian government has implemented various ICT policies and distributed numerous ICT devices to secondary schools across the country (FME, 2019), many teachers still refrain from utilizing these devices in their teaching methods (Dele-Ajayi, Fasae, & Okoli, 2021). In light of this, Akinwunmi et al. (2020) pointed out the need for school principals to be trained in the appropriate knowledge and competencies to support and promote technology integration in their schools. While previous studies on technology leadership have employed the International Society for Technology in Education (ISTE) (2002, 2009, 2018) to investigate the characteristics of technology leaders in schools in Western industrialized countries (Alkrdem, 2014), these standards have received limited attention in developing nations like Nigeria. Recognizing the significance of technology leadership among school administrators in utilizing ICT to enhance teaching and learning, it is important to understand principals' engagement and involvement around technology use in Nigerian public schools. Moreover, since school administrators vary in terms of their demographic characteristics (age, gender, educational qualification, and years of leadership experience), their responses to technology leadership practices may also be dependent or influenced by these variables. For instance, Seyal (2012) conducted a study that examined how different demographic factors affect ICT usage by school principals and found that age, gender, and computer expertise significantly impacted the technology leadership practices of school principals. In light of the above discussion, this research seeks to investigate the level of technology leadership among Nigerian public secondary school principals. Thus, the study is driven by the research questions:

- What level of technology leadership practices do public school principals exhibit?
- Does the technology leadership of public secondary school principals differ by age, gender, educational background, and administrative experience?
- What are the obstacles school principals face when incorporating technology in their schools?

## LITERATURE REVIEW

Technology leadership has recently appeared as a prominent manifestation of leadership style within the education environment, and it is considered a vital competence for school leaders in the 21st century (Okeke, 2021). Technology leadership refers to the 'virtual relationships of influence' that impact individuals who use technological knowledge and skills in their daily interactions across professional education and training, including those who often engage with social networking platforms both at home and at work (Chua & Chua, 2017; Jameson, 2013). This concept also

emphasizes the mutually beneficial interaction between technology use in schools and school infrastructure, which could include the use of ICT for leadership and management assistance, such as making organizational and policy choices (Anderson & Dexter, 2005; Flanagan & Jacobsen, 2003). According to Hüsing et al. (2013), there are two components to technology leadership abilities: ICT skills and leadership skills. The ICT skills involve a comprehensive understanding of the use and upkeep of ICT, including functional, technical, product, and customer experience-related maintenance. On the other hand, leadership skills pertain to the ability to manage and lead an organization, which includes envisioning, creating and fostering relationships across boundaries, sense-making, and inventing. Technology leadership prioritizes the management of organizations and the execution of administrative policies that are based on the use of information and communication technologies (ICTs).

As schools are becoming more dependent on technology, school leaders must adapt to become technology leaders who can manage workers using technology in e-learning environments (Hüsing et al., 2013) and support teachers' effective integration of technology into the instructional process (Richardson, Flora, & Bathon, 2013); develop and implement a strategic plan for their organization's usage of technology to improve student results (Beytekin, 2014); and create a conducive environment for effective technology use by providing vision, setting goals, and promoting professional development (Christensen et al., 2018; Raman & Thannimalai, 2019). According to Chua & Chua (2017), there is a need for school leaders and followers to possess the right mindset, leadership abilities, knowledge, and skills related to e-teaching and learning, networking, and computer-mediated competencies before implementing technology leadership practices.

According to previous studies, a principal's technological leadership significantly impacts teachers' technical proficiency and literacy, leading to more effective technology-based learning in the classroom (Chang, 2012; Raman & Shariff, 2018). Khaw et al. (2022) claimed that digital leadership of educational administrators is also positively connected to long-term success and has the potential to improve management growth and organizational sustainability. Mwawasi (2014) claimed that school administrators who exhibit technology leadership practices help teachers access ICT resources and provide training and assistance for integrating technology into teaching and learning. The reviewed literature suggests that technology leadership practices should be a crucial part of school administrators' training programs to improve the effectiveness of school administration. Studies have shown that school administrators have considered their technology leadership high, indicating their preparedness, knowledge, and skills in using technology to support instruction (Alkrdem, 2014; Beytekin, 2014; Mendoza & Catiis, 2022).

Despite the importance of technology leadership as a prerequisite competence for school leaders in the 21st century, research indicates that most school leaders lack the vision and knowledge to plan, lead and implement the integration of ICT in their schools (Mingaine, 2013; Okeke, 2021; Razzak, 2015). Mingaine (2013) further revealed that school leaders sometimes need help to use the available ICT infrastructures in their schools to facilitate the teaching and learning process even after putting so much effort into obtaining them. In addition, many schools have faced challenges in providing up-to-date technical facilities and often lack the technical staff to maintain and support technology infrastructure, which can significantly hinder school principals' ability to demonstrate technology leadership (Sincar, 2013). Studies have also indicated that school administrators find it difficult to assume their roles as technology leaders due to financial limitations, cultural problems, red tape, restricted access to technical resources, poverty, teachers' opposition to change and inadequate teacher preparation (Sincar, 2013; Waari, 2022). To overcome the challenges facing school principals in assuming their roles as technology leaders, Okeke (2021) suggested that school leaders should secure adequate funding, provide ongoing professional development, and foster a culture of innovation and adaptability within their schools. However, this would require school leaders to be visionary, open-minded, skilled, and prepared to capitalize on the opportunities presented by technology despite its drawbacks. In addition, Waari (2022) suggested that the

government can play a role in providing schools with better infrastructure and a more robust culture that welcomes change, which motivates people to convert to using technology and be prepared and ready to promote and encourage it exceedingly well.

## CONCEPTUAL FRAMEWORK

This study adopts a conceptual framework based on the National Educational Technology Standards for Administrators presented by the International Society for Technology in Education (ISTE, 2002). The ISTE standards are widely regarded as the definitive framework for technology competencies for school administrators (Arafeh, 2015). Sujo-Montes & Gallagher (2011) argued that these standards are particularly relevant in today's educational landscape, where school leaders must demonstrate proficiency in technology use and embrace a vision that integrates technology seamlessly into the curriculum. Research has shown that the integration and use of ICT by teachers and the implementation of technological transformation in schools largely depend on the technology leadership practices of school principals (Banoğlu et al., 2023; Flanagan & Jacobsen, 2003). Educational leaders who aim to transform their school's teaching, learning and organizational culture must adopt technology leadership practices that are directive, supportive, participative, or achievement-oriented (Olowoselu, Mohamad, & Aboudahr, 2019). These technology leadership practices are characterized into six domains, including leadership and vision, teaching and learning, productivity and professional practice, support, management and operations, assessments and evaluation, and social, legal and ethical issues (ISTE, 2002), as shown in Figure 1. Nevertheless, the ISTE made further revisions to these criteria, including visionary leadership, digital age learning culture, excellence in professional practice, systemic improvement, and digital citizenship (ISTE 2009). The criteria also set the baseline for assessing the skills and knowledge that school administrators and leaders must possess to facilitate digital-age learning, adopt technology, and revolutionize the instructional environment (ISTE, 2018).


**Figure 1:** Technology Leadership Model for Administrators (ISTE, 2002).

Many schools in Nigeria began implementing technology standards after the pandemic due to the challenges faced during remote learning; however, little is known about their effectiveness. Given the Nigerian educational system efforts to keep up with the impact of technological advancements and innovations on society and education, adopting the NETS-A standards (ISTE, 2002) as a conceptual framework in this study could provide valuable insights into the key technological behaviors and competencies possessed by school principals. This could also offer a helpful perspective on the professional development requirements of school leaders, which are crucial for meeting teachers' changing needs and expectations and promoting self-development.

## METHODOLOGY

This study employed a survey research design consisting of both closed and open-ended questions to collect information from participants on how ICT and technology leadership abilities were practiced by public secondary school principals in Nigeria. Moreover, it also allowed the researcher to ascertain the type of link that exists between principals' technology leadership and their demographic variables and the consequences for educational settings. Ethical procedures given by the State Ministry of Education were strictly adhered to. Consent was also obtained from the State Coordinator of the All-Nigeria Confederation of Principals of Secondary Schools before the commencement of the study. Secondary school principals involved in the study were adequately informed, and the nature of the study was explained to them via the organization meeting platform before forwarding the link to the survey.

### Research Participants

This study focuses on 100 principals from public secondary schools in a Southwestern State in Nigeria. These principals are all registered members of the All-Nigeria Confederation of Principals of Secondary Schools (ANCOPPS) at the state level. They attended the 2023 annual general meeting, where they were urged to adopt more proactive management practices in the digital age. About 65% of the respondents were males, while 35% were females, with their length of experience as a principal ranging from 1 to 15 years as school leaders. Participants educational level include NCE (9%), OND (2%), HND (2%), BSc (52%), PGD (11%), Master's (27%), and PhD 6%). Their age ranges from 25 to 65 years, while their years of teaching experience range from 1–35 years. The demographic details of respondents are displayed in Table 1.

***Table 1:*** *Demographic details of study participants*

| **Variables** | | **Frequency (%)** |
|---|---|---|
| **Gender** | Male | 65.0 |
| | Female | 35.0 |
| **School level** | Junior high school | 42.0 |
| | Senior high school | 58.0 |
| **Age** | 25 – 35 | 21.0 |
| | 36 – 45 | 24.0 |
| | 46 – 55 | 18.0 |
| | 56 – 65 | 37.0 |
| **Educational Background** | National Certificate in Education | 7.0 |
| | Ordinary National Diploma | 2.0 |
| | Higher National Diploma | 2.0 |
| | Postgraduate Certificate in Education | 11.0 |
| | Bachelor's degree | 47.0 |

| | | |
|---|---|---|
| | Master's degree | 25.0 |
| | Doctor of Philosophy | 6.0 |
| Years of teaching experience | 1–5 | 8.0 |
| | 6–10 | 15.0 |
| | 11–15 | 16.0 |
| | 16–20 | 7.0 |
| | 21–30 | 15.0 |
| | 31–35 | 39.0 |
| Years of experience as a principal | 1–3 | 53.0 |
| | 4–6 | 30.0 |
| | 7–9 | 7.0 |
| | 10–12 | 7.0 |
| | 13–15 | 3.0 |
| Total | | 100 |

**Instrument**

The questionnaire used in this study was adopted from the Assessment of Technology Leadership by Principals (ATLP), a tool developed by the American Institutes for Research in collaboration with the UCEA Center for Technology Leadership in Education (CASTLE) following the ISTE guidelines for administrators. Its main objective was to collect insights on the technological leadership tendencies and engagements of school principals over the academic year, as well as perceptions of their technological knowledge and utilization.

The instrument is composed of two parts. The first part requires the respondents to provide their consent and requires demographic data: age, gender, educational background, and years of experience as principals. The second part contained six dimensions and thirty-five performance indicators, outlining what a technology-savvy school leader knows and should be able to do. The six dimensions include leadership and vision (six items), teaching and learning (six items), assessment and evaluation (five items ), productivity and professional practice (five items), support management and operations (six items), and social, legal and ethical issues (seven items). All items were ranked using a four-point Likert scale coded as 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree.

The open-ended section of the survey included questions that required principals to explain how they empower teachers to use technology effectively in their teaching; ensure all teachers have equal opportunities to benefit from the school's technology resources; steps taken to prevent cybercrime and inform teachers about these precautions; address teachers' needs for technology equipment, software, and other resources; and challenges encountered as a school principal when leading technology integration in their school. if any. The survey was conducted between March and October 2023, when public school principals within the selected state in Nigeria could take part in the study. The survey was designed using Google Forms, which has features that allow the collection of identifiable information, such as email addresses, to identify the respondents and ensure the accuracy of the data. As a result, responses from more than one email address were not captured. However, participants were informed that their answers would remain private and separated from the identified email address.

**Reliability and Validity**

Three specialists first examined the accuracy of the instrument used in this study in education leadership management and technology to evaluate how well the items measure the given

construct. A trial test of the draft instrument was then conducted with ten public school principals from a specific district within the state. The feedback was used to modify the language of some items to fit the context of the study, thus retaining the initial items for each construct. Altogether, a total of thirty-five items constituted the instrument used apart from items measuring demographic characteristics. The internal consistency and reliability of the overall instrument was measured through Cronbach's alpha and showed a value of .968, which is very high. The Cronbach's alpha coefficient (α) for the sub-scales ranged between .827 and .899, all exceeding the acceptable reliability value of 0.70 suggested by Taber (2018). These results indicate that the overall items and each of the subscales effectively measure the same underlying construct (technology leadership), as detailed in Table 2.

***Table 2:*** *Reliability analysis of PTL items*

| Construct | Items | Factor loading | Cronbach's alpha |
|---|---|---|---|
| Leadership and Vision | LV1 | .539 | .850 |
| | LV2 | .661 | |
| | LV3 | .548 | |
| | LV4 | .561 | |
| | LV5 | .576 | |
| | LV6 | .660 | |
| Teaching and Learning | TL1 | .788 | .899 |
| | TL2 | .673 | |
| | TL3 | .734 | |
| | TL4 | .734 | |
| | TL5 | .706 | |
| | TL6 | .776 | |
| Assessment and Evaluation | AE1 | .585 | .874 |
| | AE2 | .688 | |
| | AE3 | .754 | |
| | AE4 | .696 | |
| | AE5 | .747 | |
| Productivity and Professional Practices | PPP1 | .662 | .843 |
| | PPP2 | .726 | |
| | PPP3 | .675 | |
| | PPP4 | .597 | |
| | PPP5 | .603 | |
| Support, Management, and Operations | SMO1 | .658 | .866 |
| | SMO2 | .751 | |
| | SMO3 | .656 | |
| | SMO4 | .651 | |
| | SMO5 | .638 | |
| | SMO6 | .694 | |
| Social, Legal, and Ethical Issues | SLE1 | .609 | .827 |
| | SLE2 | .598 | |
| | SLE3 | .518 | |
| | SLE4 | .688 | |
| | SLE5 | .553 | |
| | SLE6 | .617 | |
| | SLE7 | .745 | |

### Data Analysis

Prior to the analysis of data, an assumption of normality test was conducted using the Kolmogorov-Smirnov statistics (with Lilliefors correction) since the sample size was more than 50. The test for normality was conducted on the overall score of principals' technology leadership, showing a normal distribution as the p-value (Kolmogorov-Smirnov test) was 0.062, which is higher than 0.05. Consequently, an independent t-test and analysis of variance (ANOVA) was employed to assess differences in principals' technology leadership based on demographic profile (gender, age, educational background, and years of experience as a school administrator).

Basic statistics such as frequency (how many people answered each question), percentage distribution of the group of people who chose each answer option based on gender, average score (mean), and standard deviation (spread out of the scores) were used to summarize basic information from the dataset. The basic statistics were analysed using SPSS software. In addition, correlational analysis was used to measure how much the scores on one leadership dimension (such as, Leadership & Vision) related to the scores on another dimension ( such as, Teaching & Learning). The results show that all six dimensions of principals' technology leadership abilities were significantly and positively correlated, with coefficients ranging from 0.52 to 0.76. Moreover, written responses to the open-ended questions were analyzed using content analysis.

***Table 3:*** *Correlation analysis of among sun-constructs*

| | **LV** | **TL** | **AE** | **PPO** | **SMOG** | **SLEG** |
|---|---|---|---|---|---|---|
| LV | 1 | | | | | |
| TL | .708** | 1 | | | | |
| AE | .597** | .738** | 1 | | | |
| PPO | .531** | .744** | .669** | 1 | | |
| SMOG | .600** | .698** | .662** | .660** | 1 | |
| SLEG | .520** | .586** | .618** | .614** | .766** | 1 |

**. Correlation is significant at the 0.01 level (2-tailed).

## FINDINGS AND DISCUSSION

### Scoring Interpretation

To evaluate the overall technology leadership practices of public school administrators within this study, the mean value with its verbal interpretation, as suggested by Moidunny (2009), was used. Values between 5.00 to 4.21 indicate Very High, 4.20 to 3.21 indicate High, 3.20 to 2.61 indicates Medium/moderate, 2.60 to 1.81 indicates Low, and 1.80 to 1.00 indicate Very Low.

### Level of technology leadership abilities demonstrated by school principals

Results of the study indicate that the sampled school administrators demonstrated a moderate level of technology leadership abilities based on the six Technology Leadership practices of ISTE (2002), as shown in Table 4.

***Table 4:*** *Descriptive analysis of principals' technology leadership abilities*

| **Constructs** | **Mean** | **Std. Deviation** | **Level** |
|---|---|---|---|
| Leadership and Vision | 2.71 | .637 | Medium |
| Learning and Teaching | 2.75 | .690 | Medium |
| Assessment and Evaluation | 2.78 | .732 | Medium |
| Productivity and Professional Practices | 2.88 | .695 | Medium |
| Support, Management, and Operations | 2.66 | .669 | Medium |
| Social, Legal, and Ethical Issues | 2.65 | .681 | Medium |
| **Overall Technology Leadership** | **2.74** | **.574** | **Medium** |

Table 4 shows that the arithmetic mean values of the scores from the principals' technology leadership constructs range from 2.65 to 2.88, with the overall score for Technology Leadership $\bar{x}$ =2.74, which is above the minimum of 2.5 points indicating a moderate level of technology leadership ability among principals. Although this finding contradicts some earlier studies that have reported high levels of technology leadership abilities among school principals (Beytekin, 2014; Hamzah, Nasir, & Wahab, 2021), it is consistent with others who found the level of technology leadership practice among administrators to be moderate (Hamzah et al., 2014). The results of this study show that respondents score themselves as "moderate" across all six dimensions of their technology leadership practices based on the mean scores obtained from the scale. Based on this result, it can be assumed that principals in this study might be enthusiastic and open to actively promoting the use of technology in their schools to a reasonable level but sometimes hesitant to fully embrace its integration. In addition, these principals may be somewhat prepared and have a basic understanding of technology use but possess limited abilities to effectively organize, plan, and manage the use of technology to support the teaching and learning process in their respective schools (Mendoza & Catiis, 2022).

**Differences in principals' technology leadership according to gender, educational background, age, and years of experience as a school administrator**

Correlational analysis between principals' technology leadership shows a statistically significant weak relationship (r = 0.252) between principals' gender and their overall technology leadership. However, age, educational background, and years of experience as an administrator do not correlate with principals' technology leadership. Findings from the Leven test for equality of variances for the groups were assumed equal since the significance level of the overall score for principals' technology leadership is .116, which is greater than 0.05. In addition, the t-test for equality of means had a p-value of .012, which is less than 0.05, indicating a significant difference between male and female public school principals when looking at their technology leadership. Furthermore, the results of the t-test group statistics in Table 5 show the significant differences between the mean scores of principals' technology leadership and their sub-factors based on gender, that is, Leadership and Vision ($t[98] = -2.25$; $p<.05$), Teaching and Learning ($t[98]= -2.47$; $p<.05$), Support, Management, and Operations ($t[98] = -3.10$; $p<.05$], Social, Legal, and Ethical Issues ($t[98]= -2.11$; $p<.05$) and Overall TLC for the two groups.

***Table 5:*** *T-test statistics for principals' technology leadership by gender*

| | Male | | Female | | t – value | P – value |
|---|---|---|---|---|---|---|
| | **M** | **SD** | **M** | **SD** | | |
| Leadership and Vision | 2.60 | .638 | 2.90 | .597 | -2.254 | .026 |
| Teaching and Learning | 2.64 | .722 | 2.97 | .577 | -2.479 | .015 |
| Assessment and Evaluation | 2.72 | .768 | 2.90 | .651 | -1.215 | .227 |
| Productivity and Professional Practices | 2.80 | .686 | 3.03 | .697 | -1.599 | .113 |
| Support, Management, and Operations | 2.52 | .674 | 2.93 | .575 | -3.108 | .002 |
| Social, Legal, and Ethical Issues | 2.55 | .691 | 2.85 | .627 | -2.112 | .037 |
| Overall Technology Leadership | 2.64 | .589 | 2.94 | .497 | -2.575 | .012 |

However, no statistically significant difference was found in principals' technology leadership in terms of assessment and evaluation (t[98]= -1.17; p>.05) and productivity and professional practices (t[98]= -1.59; p>.05) based on gender. Nevertheless, the magnitude of the variance between male and female principals in terms of their overall technology leadership was found to have a moderate effect size of 0.06. This finding contradicts earlier studies that identified no substantial difference in the technology leadership of school administrators based on gender (Turan & Gökbulut, 2022). While there may be a belief that male principals are more likely to be tech-savvy, potentially causing bias in evaluating their technology leadership, studies have primarily emphasized the importance of resource availability in schools to enhance principals' technology leadership, irrespective of gender (Banoğlu et al., 2023; Sincar, 2013).

A one-way ANOVA was performed to assess how the level of principals' technological leadership varied based on their age, educational background, and length of work as school principals. The analysis of Levene's Test for homogeneity of variances revealed a P value larger than 0.05, suggesting that variances for participants' educational background and years of experience are homogeneous. Consequently, the ANOVA table was utilized to explore significant differences in principals' technological leadership based on their age, educational background, and years of experience as school administrators, and no significant differences were found. This finding supports other studies that emphasize the principals' interest in technology, vision for technology use, and professional development opportunities for principals as a driving force in fostering technology leadership rather than age, educational background, and administrator experience (Banoğlu et al., 2023; Raman & Thannimalai, 2019).

**Challenges faced by school principals when leading technology integration in their schools**

Although the study found that principals have strong technology leadership competencies, their responses to the survey reveal that they face challenges in planning, implementing, and incorporating technology in their schools. Analysis of the responses to the open-ended questionnaire yielded four major categories: *insufficient funding, inadequate resources, limited digital opportunities, an unreliable power supply* and a number of related and other categories. Analysis of participants' responses reveals that some principals tend to have mentioned more than one category in their responses.

The results show that 54% of the respondents mentioned lack of funding as a major hindrance in assuming their roles as technology leaders. Principals indicated that they lacked the financial capacity to purchase some technological equipment in their schools, recruit experts to provide basic training for students, send teachers for training, give out money for data, and maintain existing resources and infrastructure. For instance, a participant stated,

> "*Most of the technical items are very costly, and in most cases, we find it difficult to purchase them*".

Waari (2022) highlighted the correlation between inadequate school budgets and a lack of resources, which can exacerbate equity issues in disadvantaged schools. This issue is common, as many school leaders face similar challenges in providing adequate resources and staffing due to insufficient funding (Mingaine, 2013). A closer examination of the participants' responses revealed that insufficient funding was also attributed to a lack of government support and bureaucratic red tape.

Additionally, approximately 30% of the respondents reported that not all school leaders, teachers, and students have equal access to and utilize technology or ICT tools for effective teaching and learning. For instance, a participant noted,

> "*One of the challenges I face in utilizing technology in my school is the high financial costs associated with purchasing devices, software, and infrastructure. So the limited budget we have makes it difficult to promote equitable access to technology among all students*".

This lack of digital equity is also linked to a shortage of resources in schools and has contributed to disparities in how technology resources, such as the Internet, are used by students and teachers, resulting in uneven levels of digital literacy education for students (Gonzales, 2020; Sincar, 2013). Challenges associated with the lack of resources in this study were also attributed to the lack of technology infrastructure, such as WIFI networks, connectivity issues, and technical support.

In addition, findings revealed that 40% mentioned how the unreliable power supply has significantly impacted their role as technology leaders. For instance, one of the respondents noted,

> "*No regular power supply from Eko Electricity; most of the time, the school runs a generator, which is not cost-effective*".

Some principals also confirmed that the electricity supply is zero, and the high fuel cost discourages them from using any technology or ICT tools in their schools. In addition to the previously mentioned challenges, principals also face other obstacles when assuming their roles as technology leaders, as reported in this study. These obstacles include *a lack of IT literacy and willingness to participate in technology integration among teachers, excessive paperwork and time constraints, and the misuse of technology by students and teachers*. The following excerpts from the open-ended responses provide further insight into these challenges:

> *"As a school principal, leading technology integration in my school is very challenging because some educators and staff members resist incorporating technology in their classrooms because they lack confidence in their technology skills, and some prefer traditional teaching methods" (***Participant 58).**
>
> *"The lack of willingness from the government to implement technology in our school and the staff's unwillingness to accept change is a big problem"* **(Participant 76).**

> *"Network, sincerely, the problem of network is a big challenge affecting the process of technology use in my school area"* **(Participant 26).**
>
> *"The unethical and unprofessional behavior of some teachers while using available technological equipment in the school is just another obstacle on its own" (***Participant 43)**

These responses indicate that principals encounter numerous obstacles, including insufficient resources, opposition to new ideas, budget constraints, cultural issues, bureaucracy, and inadequate in-service training when taking on the role of a technology leader in their schools, corroborating the findings of Banoğlu et al. (2023) and Waari (2022).

## CONCLUSION AND RECOMMENDATIONS

As Nigeria aims to chart a course for future opportunities for its youth through the introduction of innovative technologies into the educational system as a new model for learning and development, many teachers and principals continue to struggle to assist students with minimal or no support. This study adds to the existing research on technology leadership in Nigerian public secondary schools by examining how principals plan, organize, manage, and promote technology utilization. While the principals in the sample showed moderate technology leadership practice, they reported their strongest ability in productivity and professional practice. This domain area called for educational administrators to foster a professional growth and innovation culture that encourages teachers to leverage technology and digital tools to improve student learning. Since the use of innovative technologies in Nigerian public schools is still in its infancy, there is a need for principals to stay current with emerging trends in educational technology. The result of this study suggests that some public school principals in Nigeria possibly still demonstrate a mix of confidence and hesitation regarding their ability to lead technology integration (ICT) in their schools. This study also found no connection between a principal's age, educational background, or years of experience as a school administrator and their technology leadership skills. This finding suggests these qualities might not be the biggest factors. Since this study is based on self-report data provided by principals, which might be subject to bias, further studies could explore principals' technology leadership from the perspectives of teachers and students.

Although technology leadership emphasizes the importance of school leaders creating, directing, overseeing, and utilizing technology to enhance organizational performance, principals in Nigerian public secondary schools still face numerous challenges in this regard. Practical challenges such as insufficient funding, frequent power outages, and lack of time for collaborative activities hinder principals' capacity to incorporate technology into their schools successfully. Additionally, inadequate resources, lack of support from the government and community, and bureaucratic red tape further complicate the situation, making it difficult for principals to assume their roles as technology leaders. Hence, it is suggested that educational stakeholders actively prepare principals in pre-service programs and ongoing training opportunities that will equip them with the necessary skills and knowledge to lead technology integration in their schools effectively. This preparation may also contribute to guiding policymakers, school administrators, and practitioners in supporting principals in developing their technology leadership competencies and practices. Moreover, future studies could also explore how a principal's approach to technology leadership influences teachers' technological skills and comfort level with using technology in the classroom. This approach is important because a principal's technology leadership ultimately needs to translate into practical changes in the classroom. By understanding how a principal's approach affects teachers' confidence and skills in using technology, stakeholders can better comprehend the overall effectiveness of the principals' technology leadership.

Nevertheless, the findings of this study are not universally applicable to all Nigerian schools due to the following limitations. The conclusions are based on a small sample size of one hundred principals across a Southwestern state in Nigeria, which only represents part of the population of principals in the region. Furthermore, the findings could have been influenced by self-selection bias, in which principals more interested in technology leadership are more likely to participate in the survey. As a result, the sample may have been skewed and not representative of all principals. These limitations suggest that future studies on principals' technology leadership behaviour should aim at a more diverse sample and use multiple data sources. Since the study was conducted within a specific region in Nigeria, the findings may not apply to other contexts. This is because different regions and countries have different educational systems, policies, and cultures, which may influence the technology leadership abilities of school administrators. Nevertheless, the findings may add to a broader discussion about the role of technology in the context of educational leadership in third-world countries like Nigeria and how principals from these countries can most effectively support teacher learning and student success.

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