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**AN ASSESSMENT OF THE BARRIERS TO THE ADOPTION AND  
SUSTAINABILITY OF TECHNOLOGY INTEGRATION IN  
TEACHING AND LEARNING PROCESSES IN SCHOOLS WITHIN  
ABUJA MUNICIPAL AREA COUNCIL (AMAC), ABUJA.**

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## **ABSTRACT**

This study assessed the barriers to the adoption and sustainability of technology integration in teaching and learning processes in secondary schools within Abuja Municipal Area Council (AMAC), Abuja. A mixed-methods research design was employed, combining quantitative and qualitative approaches to provide a comprehensive understanding of the research problem. Data were collected from 440 respondents, comprising 400 students who completed structured questionnaires and 40 teachers who participated in semi-structured interviews. Quantitative data were analysed using descriptive statistics, while qualitative data were analysed thematically. The findings revealed that although most schools have introduced basic digital tools such as computers and projectors, the frequency of classroom technology use remains low, limiting sustained integration. Students reported increased interest, participation, and improved understanding when technology was used; however, these benefits were unevenly experienced across schools. Significant barriers identified include inadequate access to digital devices, poor internet connectivity, insufficient teacher training, lack of technical support, and disparities between public and private schools. The study concludes that while technology integration holds significant potential to enhance teaching and learning, its effectiveness and sustainability depend on addressing systemic, infrastructural, and human-capacity constraints. The study recommends sustained investment in ICT infrastructure, continuous teacher professional development, and supportive

institutional policies to promote equitable and long-term technology integration in secondary schools within AMAC, Abuja.

**KEYWORDS:** Technology integration, Teaching and learning, Sustainability, Secondary schools, Barriers to adoption, AMAC Abuja.

## 1.0 INTRODUCTION

The rapid advancement of information and communication technologies (ICT) has significantly transformed educational systems worldwide, reshaping teaching methodologies, learning environments, and delivery modes of knowledge (Gabdo et al., 2025). Technology integration in education is widely recognised as a critical driver of improved instructional quality, learner engagement, and the development of twenty-first-century skills such as critical thinking, collaboration, and digital literacy (UNESCO, 2021; Okon et al., 2025). As societies become increasingly knowledge-driven, schools are expected to leverage digital tools to enhance pedagogical effectiveness and prepare learners for participation in a technology-oriented global economy (Magaji & Adelabu, 2012).

In developing countries, including Nigeria, governments and educational stakeholders have initiated several policies and interventions to promote the integration of technology into teaching and learning (Bello et al., 2025). These efforts include investments in ICT infrastructure, teacher professional development, and curriculum reforms that emphasise digital competencies (Federal Republic of Nigeria [FRN], 2014; Magaji et al., 2025)). Despite these initiatives, the pace and depth of technology adoption in many Nigerian schools remain uneven, with significant disparities between policy intentions and classroom realities (Ahmad & Magaji, 2024). This gap raises concerns about the sustainability and effectiveness of technology-driven educational reforms.

Empirical studies have shown that successful technology integration in schools extends beyond the mere provision of digital tools. It requires a supportive ecosystem comprising adequate infrastructure, reliable electricity and internet connectivity, skilled and motivated teachers, institutional leadership, and continuous technical support (Ertmer & Ottenbreit-Leftwich, 2010; Dickson et al., 2025; Inyang et al., 2025). Additionally, parents with insufficient income cannot afford a high-tech school (Ibrahim & Sule, 2023; Magaji & Musa, 2015; Mahmud et al., 2025). Where these conditions are absent or weak, technology initiatives often fail to translate into meaningful improvements in teaching and learning

outcomes. Consequently, schools may struggle not only to adopt educational technologies but also to sustain their use over time.

Within the Nigerian context, urban public and private schools face a complex mix of structural, institutional, and human-related challenges that constrain effective technology integration. These challenges include insufficient funding and high cost of importing digital equipment (Magaji et al., 2022), limited access to digital resources, inadequate teacher training, resistance to change, and weak maintenance cultures (Afolayan & Akinwale, 2020). In the case of schools located within Abuja Municipal Area Council (AMAC), Abuja, the situation is further influenced by rapid population growth, increasing demand for quality education, and varying levels of institutional capacity among schools.

Against this backdrop, this study assesses the barriers to the adoption and sustainability of technology integration in teaching and learning processes in schools within AMAC, Abuja. By systematically examining the technological, organisational, and human factors that hinder the effective and sustained use of educational technologies, the study seeks to provide empirical insights to inform policy formulation, school-level decision-making, and targeted interventions. Understanding these barriers is essential for designing context-specific strategies that promote inclusive, resilient, and sustainable technology integration in Nigeria's educational system.

## **2.0 Literature Review and Theoretical Framework**

### **2.1 Conceptual Review**

#### **2.1.1 Technology Integration**

Technology integration in education refers to the systematic incorporation of digital tools, resources, and media into the teaching-learning environment in ways that support and enhance educational goals rather than merely adding technology for its own sake. It encompasses not just the use of hardware and software but also the pedagogical alignment of technology with curriculum objectives, instructional strategies, and assessment practices to foster meaningful learning experiences for students (Okojie et al., 2006; Consoli et al., 2023). According to EdTech Connect, proper technology integration goes beyond making devices accessible; it involves embedding technological tools as natural and effective components of the classroom environment where students can use them to obtain, analyse, and synthesise information, solve problems, and present knowledge (EdTech Connect, 1999; ISTE Standards). As such, technology integration is viewed as an evolving, adaptive process that

requires ongoing teacher development, curriculum redesign, and reflective pedagogy—transforming how instruction is delivered and experienced (Consoli et al., 2023). However, technology adoption can be associated with a specific category of labour disengagement (Adekoya et al., 2025)

### **2.1.2 Teaching and Learning Processes in Schools**

The teaching and learning process in schools is fundamentally a structured, interactive educational exchange in which teachers facilitate students' acquisition of knowledge, skills, attitudes, and values through planned instructional activities and learning experiences. It is often defined as a transformational process in which educators establish learning objectives, design and implement instructional strategies, employ diverse resources, and provide feedback to support students' intellectual growth and development (Munna & Kalam, 2021). This process is influenced by pedagogical frameworks and models that emphasise learner engagement, instructional alignment, and continuous assessment to ensure that intended learning outcomes are achieved (McIlrath & Huitt, 1995). Effective teaching and learning processes also recognise the active role of students as participants in constructing meaning, where the interrelationship between teaching actions and learning experiences creates an environment conducive to cognitive, emotional, and social development (Munna & Kalam, 2021).

## **2.2 Theoretical Review**

### **2.2.1 Technology Acceptance Model (TAM)**

The Technology Acceptance Model, developed by Davis (1989), explains how users come to accept and use technology, emphasising that adoption is primarily influenced by two key perceptions: *perceived usefulness* and *perceived ease of use*. In the context of technology integration in schools, TAM offers a strong theoretical lens for understanding teachers' and administrators' willingness to adopt and sustain educational technology use. If teachers perceive digital tools as helpful for improving instructional effectiveness and easy to use in classroom settings, they are more likely to integrate them into teaching and learning processes. Conversely, barriers such as inadequate training, lack of technical support, poor infrastructure, and limited digital competence can negatively affect these perceptions, leading to resistance or discontinuation of technology use. Thus, TAM is particularly relevant to this study as it helps explain how human and institutional factors influence both the adoption and

long-term sustainability of technology integration in schools within Abuja Municipal Area Council (AMAC), Abuja (Davis, 1989; Venkatesh & Davis, 2000).

### **2.3 Empirical Review**

Ubabuiké and Ojéchi (2025) examined how the use of digital learning tools influences student engagement and retention in public secondary schools in Anambra State, Nigeria. Their findings revealed that the incorporation of interactive multimedia materials and online learning resources substantially improved students' concentration, motivation, and active involvement during lessons. The study further demonstrated that technology-supported instruction promotes collaborative learning and enables prompt feedback, which enhances students' comprehension and long-term retention of instructional content. Overall, the authors concluded that purposeful technology integration has the potential to reshape classroom interactions and foster higher levels of active student engagement.

Similarly, Chukwudum, Ekwealor, Uchefuna, and Ibeh (2025) investigated the effect of technology usage on students' learning outcomes in Nigerian secondary schools. The study reported that schools utilising digital tools such as projectors, tablets, and educational software recorded greater levels of student interaction and participation than those that depended exclusively on conventional teaching approaches. These findings emphasise the capacity of educational technologies to support interactive teaching methods that stimulate students' involvement in classroom discussions and learning activities.

McCall (2025) explored the association between technology integration and student engagement in secondary education across Nigeria. The results indicated that learners exposed to blended learning settings—combining face-to-face instruction with online simulations, interactive quizzes, and collaborative platforms—exhibited enhanced behavioural, cognitive, and emotional engagement. The study also noted that technology-enhanced instruction minimises learner passivity and encourages students to take more active roles in their learning processes, thereby improving overall classroom engagement.

In a broader international context, Spiteri and Rundgren (2020) assessed the impact of classroom technology integration on students' motivation and participation, including evidence from African schools. Their findings showed that when digital tools are effectively aligned with instructional objectives, they significantly improve students' willingness to participate in learning activities and support collaborative learning practices. The study

highlighted that technology offers multiple engagement pathways, such as gamified learning and interactive discussions, which can be adapted to the Nigerian educational environment to boost student participation.

Onuoha and Eze (2024) examined the use of mobile learning platforms in Nigerian secondary schools and their impact on student engagement and classroom interaction. The study found that students who used mobile learning applications were more actively involved in group assignments, classroom discussions, and quizzes compared to their peers in traditional learning settings. The authors concluded that integrating technology into instruction can address limitations of conventional pedagogy, promote active learning, and significantly enhance students' engagement and participation in classroom activities.

## **2.4 Research Gap**

Despite the growing body of empirical evidence demonstrating the positive influence of technology integration on student engagement, participation, and learning outcomes in Nigerian secondary schools (Ubabuiké & Ojéchi, 2025; Chukwudum et al., 2025; Mccall, 2025; Onuoha & Eze, 2024; Spiteri & Rundgren, 2020), most existing studies have predominantly focused on the outcomes of technology use rather than the underlying constraints that hinder its adoption and long-term sustainability. The reviewed studies primarily emphasise the benefits of digital tools, mobile learning platforms, and blended learning environments, with limited attention to contextual barriers, including infrastructural inadequacies, teacher capacity, institutional support, funding limitations, and policy implementation challenges, particularly at the local government level. Moreover, there is a noticeable geographical gap, as few studies have specifically examined schools within the Abuja Municipal Area Council (AMAC), Abuja, where variations in school ownership, resource availability, and administrative capacity may significantly influence technology integration practices. Consequently, there remains insufficient empirical evidence on the specific barriers affecting both the adoption and sustained use of educational technologies in this context. This gap underscores the need for a context-specific assessment that moves beyond outcomes to critically examine the systemic, institutional, and human factors constraining the integration of sustainable technologies in schools within AMAC, Abuja.

### **3.0 METHODOLOGY**

#### **3.1 INTRODUCTION**

This section outlines the methodological framework adopted to examine the barriers affecting the adoption and sustainability of technology integration in teaching and learning processes within schools in Abuja Municipal Area Council (AMAC), Abuja. The study utilises a mixed-methods approach, combining quantitative and qualitative techniques to generate a comprehensive understanding of the research problem. This approach enables the study to capture measurable trends in technology use while also exploring teachers' lived experiences and perceptions of the challenges of integrating and sustaining technology in classroom practice.

#### **3.2 Research Design**

The study adopts a mixed-method research design that integrates both quantitative and qualitative data collection and analysis procedures. This design is appropriate for educational research as it facilitates the examination of numerical data alongside in-depth contextual insights. Through questionnaires and interviews, the study provides a balanced analysis of institutional, technological, and human-related barriers to technology integration, yielding findings that are both generalizable and context-specific.

#### **3.3 Study Area**

The research is conducted within the Abuja Municipal Area Council (AMAC) in the Federal Capital Territory (FCT), Nigeria. AMAC comprises a blend of public and private secondary schools with varying degrees of access to and utilisation of educational technologies. The area is selected for its educational diversity, rapid urbanisation, and strategic relevance as Nigeria's administrative capital, making it a suitable setting for assessing challenges associated with the adoption and sustained integration of technology in schools.

#### **3.4 Population and Sample Size**

The study population comprises senior secondary school students (SS1–SS3) and teachers in public and private secondary schools within AMAC. Available records indicate that AMAC hosts 32 of the 90 government secondary schools in the FCT, with an estimated student population of 30,000 to 40,000 when private schools are included. This population size provides an adequate sampling frame to ensure representativeness across schools with differing levels of technology availability and utilisation.

### **3.5 Sampling Techniques**

The study employs a combination of simple random sampling and purposive sampling techniques. Simple random sampling is used to select schools, ensuring that each school has an equal chance of inclusion and minimising selection bias. Purposive sampling is applied to identify schools with noticeable variations in technology integration or those that have implemented specific digital initiatives. This combination ensures a diverse sample that adequately reflects different technology adoption contexts within AMAC.

### **3.6 Data Collection Instruments**

Two primary instruments are used for data collection. Semi-structured interviews are conducted with teachers to obtain qualitative data on their experiences, perceptions, and challenges related to technology adoption and sustainability in classroom instruction. Additionally, structured questionnaires with closed-ended items are administered to students to gather quantitative data on access to technology, frequency of use, perceived challenges, and participation in technology-supported learning activities.

### **3.7 Data Collection Procedure**

Data collection involves two key respondent groups. Teachers from selected schools participate in interviews to elicit detailed insights into institutional and pedagogical barriers to technology integration. Students complete questionnaires designed to capture their experiences with technology use in learning environments and the challenges that affect consistent and effective utilisation of digital tools in classrooms.

### **3.8 Validity and Reliability**

To ensure the study's credibility, both validity and reliability measures are applied. Content validity is established through expert review and pilot testing of the research instruments to confirm that they adequately capture the study variables. Reliability of the student questionnaire is assessed using Cronbach's alpha coefficient, with a minimum acceptable value of 0.70, indicating satisfactory internal consistency of the measurement items.

### **3.9 Data Analysis**

Quantitative data from the questionnaires are analysed using descriptive statistical techniques, such as frequencies and percentages, to identify prevailing patterns related to technology adoption and sustainability challenges. Qualitative data from teacher interviews are analysed thematically, enabling the identification of recurring themes and contextual

explanations of barriers to technology integration. The integration of quantitative and qualitative findings enables a comprehensive interpretation of the research objectives and strengthens the study's overall analytical rigour.

#### 4.0 DATA PRESENTATION AND ANALYSIS OF RESULTS

##### 4.1 Introduction

This section presents and analyses the empirical findings of the study on the barriers affecting the adoption and sustainability of technology integration in teaching and learning processes in secondary schools within Abuja Municipal Area Council (AMAC), Federal Capital Territory (FCT), Abuja. A total of 440 respondents participated in the study, comprising 400 students who completed structured questionnaires and 40 teachers who participated in semi-structured interviews. Student data were collected electronically via Google Forms on shared tablet devices, and quantitative responses were analysed using the Statistical Package for Social Sciences (SPSS) to generate descriptive statistics. Qualitative data obtained from teacher interviews were transcribed verbatim and analysed thematically to identify recurring patterns and contextual insights. The results are organised to align with the study objectives, covering respondents' characteristics, the level and frequency of technology integration, perceived academic benefits, engagement outcomes, and challenges to sustained adoption, with quantitative and qualitative findings triangulated to enhance analytical depth.

##### 4.2 Analysis of Questionnaire Responses

###### 4.2.1 Demographic Characteristics of Respondents

**Table 4.1: Students' Demographic Profile**

Demographic Variable	Category	Frequency (n = 400)
Gender	Male	169
	Female	231
Age	10–12	67
	13–15	152
	16–18	179
	19+	2
School Type	Public	200
	Private	200
Class Level	Junior Secondary	200
	Senior Secondary	200

**Source:** Field Survey, 2025

Table 4.1 presents the demographic distribution of the student respondents. Female students constituted a larger proportion of the sample (57.8%) than male students (42.3%), enabling meaningful gender-based interpretation of technology access and use. Most respondents (82.8%) were between 13 and 18 years of age, representing the typical secondary school population. The equal representation of students from public and private schools, as well as junior and senior secondary levels, enhances the sample's representativeness and strengthens the reliability of conclusions drawn about barriers to technology adoption and sustainability across school categories.

#### 4.2.2 Technology Integration in Teaching and Learning

**Table 4.2: Availability of Digital Tools for Teaching and Learning**

Response	Frequency (n)	Percentage (%)
Yes	295	73.8
No	105	26.3
Total	400	100.0

**Source:** Field Survey, 2025

Table 4.2 indicates that a majority of the students (73.8%) reported the presence of digital tools in their schools, while 26.3% indicated a lack of access. This suggests that although technology has been introduced in many schools within AMAC, a significant proportion of students still operate in environments without digital learning tools, revealing access-related barriers that undermine equitable and sustainable technology integration.

**Table 4.3: Frequency of Classroom Technology Use**

Response	Frequency (n)	Percentage (%)
Daily	4	1.0
Weekly	137	34.3
Rarely	191	47.8
Never	68	17.0

**Source:** Field Survey, 2025

Table 4.3 shows that regular use of technology in classrooms remains limited. Only 1% of students reported daily use, while approximately one-third experienced weekly integration. Notably, a large proportion of students (64.8%) indicated that technology was either rarely

used or never used in classroom instruction. This highlights a sustainability challenge in which the mere availability of technology does not translate into consistent instructional use.

**Table 4.4: Commonly Available Technologies in Schools**

Technology Type	Frequency (n)	Percentage (%)
Smartboards	38	9.5
Tablets	78	19.5
Computers	329	82.3
Online Platforms	4	1.0
Projectors	179	44.8
None	67	16.8

**Source:** Field Survey, 2025

Table 4.4 reveals that computers are the most widely available digital tools (82.3%), followed by projectors (44.8%). Advanced tools such as smartboards, tablets, and online learning platforms are minimally available. This pattern suggests that technology integration in AMAC schools is mainly limited to basic hardware, with low adoption of interactive and cloud-based technologies, posing a challenge to sustainable and innovative teaching practices.

#### 4.2.3 Perceived Impact on Academic Performance

**Table 4.5: Students' Perception of Technology Impact on Academic Performance**

Response	Frequency (n)	Percentage (%)
Yes, significantly	214	53.5
Somewhat	118	29.5
No	68	17.0

**Source:** Field Survey, 2025

Table 4.5 indicates that over half of the respondents (53.5%) perceived a significant improvement in their academic performance due to technology use, while 29.5% reported moderate improvement. However, 17% observed no improvement, suggesting that the academic benefits of technology are influenced by factors such as frequency of use, teacher competence, and adequacy of infrastructure.

**Table 4.6: Subject Areas Most Enhanced by Technology Use**

Subject Area	Frequency (n)	Percentage (%)
Science	294	73.5
Mathematics	255	63.8
English	155	38.8
Social Studies	72	18.0
Biology	41	10.3
None	67	16.8

**Source:** Field Survey, 2025

Table 4.6 shows that Science and Mathematics recorded the most significant perceived improvement through technology use, reflecting the suitability of digital and visual tools for STEM-related instruction. Conversely, humanities-based subjects showed lower levels of improvement, indicating uneven pedagogical integration across subject areas.

**Table 4.7: Effectiveness of Technology in Enhancing Understanding**

Response	Frequency (n)	Percentage (%)
Yes	333	83.3
No	67	16.8

**Source:** Field Survey, 2025

Table 4.7 demonstrates that a large majority of students (83.3%) believed that technology enhances their understanding of lessons compared to traditional teaching methods. This supports the view that multimedia and interactive tools improve comprehension, though a minority still face challenges linked to limited exposure and inconsistent use.

#### 4.2.4 Impact on Student Engagement and Participation

**Table 4.8: Student Interest in Technology-Supported Lessons**

Response	Frequency (n)	Percentage (%)
Yes	400	100.0
No	0	0.0

**Source:** Field Survey, 2025

Table 4.8 reveals unanimous student agreement that technology increases their interest in lessons. This indicates a strong motivational effect of digital tools and underscores the potential of technology to enhance engagement if sustainably integrated.

**Table 4.9: Relationship Between Technology Availability and Classroom Participation**

Response	Frequency (n)	Percentage (%)
Yes	283	70.8
No	117	29.3

**Source:** Field Survey, 2025

Table 4.9 shows that 70.8% of students felt that access to technology improved their class participation, while 29.3% did not share this view. This disparity suggests that participation gains depend not only on access but also on effective facilitation and instructional quality.

**Table 4.10: Most Engaging Features of Educational Technology**

Feature	Frequency (n)	Percentage (%)
Interactive lessons	353	88.3
Visual aids (videos/images)	353	88.3
Group activities	235	58.8
Online quizzes	255	63.8
Other	1	0.3
None	0	0.0

**Source:** Field Survey, 2025

Table 4.10 indicates that interactive lessons and visual aids are the most engaging elements of educational technology, followed by online quizzes and group activities. These findings suggest that participatory and multimedia-based approaches are central to sustaining student engagement in technology-enhanced classrooms.

#### 4.2.5 Challenges to Adoption and Sustainability

**Table 4.11: Challenges Encountered in Using Technology**

Challenge	Frequency (n)	Percentage (%)
Lack of access to devices	396	99.0
Poor internet connection	231	57.8
Lack of teacher support	117	29.3
Frequent technical issues	42	10.5

**Source:** Field Survey, 2025

Table 4.11 identifies limited access to devices and poor internet connectivity as the most critical barriers to technology integration. These infrastructural challenges significantly

undermine sustained usage and were further emphasised by teachers as significant constraints, particularly in public schools.

**Table 4.12: Students' Perception of Equal Access to Technology**

Response	Frequency (n)	Percentage (%)
Yes	224	56.0
No	176	44.0

**Source:** Field Survey, 2025

Table 4.12 shows that while slightly more than half of the students perceived technology access as equitable, a substantial proportion (44%) reported unequal access. This highlights systemic disparities linked to school type, funding levels, and availability of digital infrastructure.

### 4.3 Analysis of Teacher Interview Responses

Teachers reported that private schools generally possess a wider range of digital tools, including tablets, smartboards, laptops, and online platforms, while public schools rely mainly on shared computer laboratories and projectors. The frequency of technology use was higher in private schools, with regular weekly or daily integration. In contrast, public schools experienced irregular use due to device shortages, poor internet connectivity, and unstable electricity supply. Teachers identified interactive and visually rich tools as the most effective for improving comprehension and engagement, particularly in STEM subjects. Although technology was perceived to improve academic outcomes across school types, sustained impact was more evident in private schools due to consistent access, institutional support, and administrative commitment.

### 4.4 Discussion of Findings

The findings indicate that technology integration in secondary schools within AMAC has the potential to enhance student engagement, participation, and academic understanding. While most students reported exposure to digital tools and increased interest in lessons, actual classroom use remains inconsistent, highlighting sustainability challenges. Basic technologies such as computers and projectors dominate, while advanced and interactive platforms are rarely utilised. Furthermore, infrastructural limitations, unequal access, limited teacher support, and poor internet connectivity significantly constrain effective and sustained integration, particularly in public schools. Overall, the study demonstrates that although

technology positively influences teaching and learning processes, addressing systemic and institutional barriers is essential to achieving sustainable and equitable technology integration in schools within AMAC, Abuja.

## 5.0 CONCLUSION AND RECOMMENDATIONS

This study assessed the barriers to the adoption and sustainability of technology integration in teaching and learning processes in secondary schools within Abuja Municipal Area Council (AMAC), Abuja. The findings revealed that although digital tools are available in many schools and widely perceived as enhancing student engagement, participation, and understanding, their integration into classroom instruction remains inconsistent and largely unsustainable. Technology use is predominantly limited to basic tools such as computers and projectors, with minimal adoption of advanced and interactive platforms. Key barriers identified include inadequate access to digital devices, poor internet connectivity, uneven distribution of resources between public and private schools, limited teacher capacity, and insufficient institutional support. These challenges significantly constrain the regular and effective use of technology, thereby limiting its potential to improve teaching and learning outcomes across schools in AMAC.

Based on these findings, the study recommends that government and educational stakeholders prioritise sustained investment in ICT infrastructure, particularly in public secondary schools, to ensure equitable access to digital learning tools. Continuous professional development programmes should be implemented to enhance teachers' digital competence and pedagogical skills for effective technology integration. In addition, school administrators should establish supportive policies that encourage regular use of technology, including maintenance plans, technical support systems, and reliable internet provision. Strengthening public-private partnerships and aligning technology initiatives with curriculum objectives will further promote the long-term sustainability of technology integration, ensuring that its educational benefits are consistently realised across schools within AMAC, Abuja.

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