Analysis Of the Technical Efficiency of Nigerian Banks Based on Their Ai-Driven Technology

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Abstract

This research paper looks into how Ai-based Fintech solutions have improved the operational efficiency of Nigerian banks, using Data Envelopment Analysis (DEA). By applying DEA, the study assesses the technical efficiency of banks that adopted AI-driven technologies between 2019 and 2022, setting a benchmark for how efficiently resources are used. The findings show that banks, using AI solutions, have significantly improved their technical efficiency. This is mainly because of lower operational costs and more efficient customer service processes, even during the COVID-19 pandemic. However, the study also highlights that the efficiency gains vary among banks, depending on factors like the level of AI integration and the competence of management. These insights are valuable for Nigerian banks and their fintech partners, helping them optimize AI deployments to boost operational performance. The paper adds to the broader understanding of AI in financial services, stressing the need for tailored implementation strategies to maximize efficiency benefits.

Keywords: Artificial Intelligence; Financial Technology; Technical Efficiency; AI-Driven Fintech; Data Envelopment Analysis

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Introduction

Artificial Intelligence (AI) has dramatically changed many industries, and the financial technology (FinTech) sector is no exception. AI's ability to analyze large datasets, predict market trends, and automate processes has made it a key driver of innovation in financial services. As a result, partnerships between AI-driven tech firms and traditional financial institutions have become more common, reshaping how financial services are delivered.

FinTech, short for Financial Technology, integrates technology into financial services to make them more efficient and accessible. This field includes a wide range of innovations aimed at improving, streamlining, or revolutionizing financial services. AI, on the other hand, is a branch of computer science that creates systems and machines with human-like intelligence.

The combination of AI and FinTech has led to several important collaborations and partnerships. These collaborations are driving innovation, improving efficiency, and creating new opportunities in the financial services industry. By leveraging the strengths of both AI technologies and financial expertise, these partnerships are creating solutions that are more efficient, accessible, and personalized. This has led to the development of advanced financial products like automated investment platforms, intelligent chatbots, and fraud detection systems, which have significantly changed the financial services landscape.

One of the most transformative advancements recently in the banking sector is the use of AI-based solutions, especially through chatbots. These AI-powered tools have revolutionized how banks interact with their customers, offering 24/7 service, enhancing customer satisfaction, and boosting operational efficiency. By automating processes, reducing transaction times, and minimizing manual errors, AI has greatly improved the efficiency of financial services. It has also made these services more accessible, allowing people and businesses to interact with financial products and services remotely, often at a lower cost.

In Nigeria, the use of AI-powered solutions in banking started in the mid-2010s when banks began exploring AI's potential to improve customer service. Before this, services were mainly handled through traditional channels like in-person banking, phone calls, and emails. While these methods were somewhat effective, they had significant limitations, such as long wait times, limited availability (especially outside banking hours), and the high cost of maintaining large customer service teams.

As digital banking became more popular in Nigeria, thanks to increased internet access and smartphone use, banks began seeking innovative ways to improve their services. AI emerged as a promising solution, offering the ability to automate routine customer interactions, cut operational costs, and provide 24/7 service. The idea of chatbots—AI programs designed to simulate human conversation—started gaining attention as a useful tool for this purpose.

However, integrating AI into FinTech isn't without its challenges. Issues like data privacy, regulatory compliance, and the ethical implications of AI decision-making are crucial considerations. Additionally, the fast pace of technological advancements means that everyone involved in FinTech partnerships must continuously adapt and innovate.

Using AI-driven Fintech solutions in Nigerian banks have the potential to boost technical efficiency and lower operational costs. But there's a lack of empirical evidence on how much efficiency is actually gained and what factors influence these gains. This research aims to fill that gap by analyzing how AI-based Fintech adoption has improved the technical efficiency of Nigerian banks, offering insights into the effectiveness of these technological implementations.

2.0 Literature Review

2.1 Collaboration and Partnership of AI and FinTech

This study is based on the Dynamic Capabilities Theory, introduced by David Teece, Gary Pisano, and Amy Shuen in 1997. This theory builds on the Resource-Based View (RBV) by focusing on a firm's ability to adapt, integrate, and reconfigure internal and external skills in response to changing environments. For Nigerian banks, the fast-evolving world of FinTech and AI means they need to develop dynamic capabilities to stay competitive. These capabilities include innovating, collaborating with FinTech firms, and effectively integrating AI technologies into their operations. The Dynamic Capabilities Theory helps explore how Nigerian banks can successfully

handle the challenges and opportunities that AI-based Fintech presents, ensuring long-term performance improvements.

Recently, many FinTech platforms have started using AI solutions from third-party providers to enhance their services. This integration of AI into FinTech has led to a wave of collaborations and partnerships between traditional financial institutions and tech companies. These partnerships aim to combine the strengths of both sides to create more efficient, secure, and innovative financial services.

FinTech involves using technology to make financial services more efficient and accessible. AI systems are fundamentally driven by data, with the quality and quantity of data directly affecting how well AI models work. Modern AI uses large datasets and powerful computing resources to train models that can perform a variety of complex tasks. This technology includes a wide range of methods and techniques designed to enable computers to do tasks that usually require human intelligence, such as learning from experience, reasoning, problem-solving, understanding natural language, and perception. At its core, AI is powered by algorithms—sets of instructions that enable machines to perform specific tasks. These algorithms can be categorized based on their function and complexity.

(i) **Machine Learning (ML)**: This area of AI focuses on creating algorithms that help machines learn from data and make predictions or decisions. Machine learning can be split into three types: supervised learning, unsupervised learning, and reinforcement learning. Supervised learning involves training the system with labeled data, while unsupervised learning finds patterns in data without pre-labeled outcomes. Reinforcement learning teaches models to make sequences of decisions by rewarding good actions and penalizing bad ones.

(ii) **Deep Learning**: A specialized branch of machine learning, deep learning uses artificial neural networks with multiple layers (hence "deep") to analyze complex patterns in large datasets. Deep learning has led to major advancements in image and speech recognition, natural language processing, and autonomous systems.

(iii) **Natural Language Processing (NLP)**: This field of AI focuses on enabling machines to understand, interpret, and generate human language. NLP techniques are used in various applications, including chatbots, language translation, and sentiment analysis. By processing large amounts of text, NLP systems aim to understand the in-depth of human communication and provide meaningful interactions.

Table 1: Areas of Integration of Artificial Intelligence (AI) with Financial Technology (FinTech)

S/N	Areas of integration of Artificial Intelligence (AI) with FinTech	Description	Example	Significance
1.	Robo-Advisory and Wealth Management	Robo-advisors use AI algorithms to provide automated, algorithm-driven financial planning services with minimal human intervention. These platforms offer personalized investment advice and portfolio management based on individual risk profiles and financial goals.	Collaborations between AI firms and traditional asset management companies have led to the development of sophisticated robo-advisors that can manage investments, rebalance portfolios, and optimize tax strategies in real-time.	These partnerships democratize access to wealth management services, making them available to a broader audience, including those who might not have previously had access to financial advisory services.
2.	Fraud Detection and Risk Management	AI is increasingly being used to detect and prevent fraud by	Financial institutions are partnering with AI companies	AI-driven fraud detection systems enhance the security

		analyzing large datasets to identify suspicious patterns and anomalies in real-time. This includes monitoring transactions for unusual activities and assessing credit risk through advanced predictive analytics.	to deploy machine learning models that can detect fraudulent activities across various payment channels, reducing the incidence of fraud and improving security.	of financial transactions and reduce financial losses, making them a crucial area of collaboration in the fight against financial crime.
3.	Personalized Financial Services	AI enables the creation of highly personalized financial products and services by analyzing individual customer data to understand their needs, preferences, and behavior. This includes personalized credit scoring, tailored loan offers, and customized financial advice.	FinTech firms are collaborating with AI startups to offer personalized financial planning tools that can recommend specific savings plans, investment strategies, and spending habits based on a user's financial data.	These collaborations enhance customer experience by providing more relevant and tailored financial products, improving customer satisfaction, and fostering loyalty.

4. *(case study)*	Customer Service Automation (Chatbots and Virtual Assistants)	AI-powered chatbots and virtual assistants are being integrated into FinTech platforms to handle customer inquiries, provide financial advice, and execute transactions. These tools use natural language processing (NLP) to understand and respond to customer queries.	Partnerships between AI firms and banks have led to the deployment of chatbots that can manage routine banking tasks, such as checking account balances, transferring money, and answering frequently asked questions.	Automated customer service solutions reduce operational costs and improve service efficiency, allowing financial institutions to provide 24/7 support to their customers.
5.	Credit Scoring and Lending	AI is transforming credit scoring by analyzing alternative data sources, such as social media activity, mobile phone usage, and online behavior, to assess the creditworthin	FinTech companies are partnering with AI startups to develop alternative credit scoring models that can offer loans to underbanked populations, thus expanding	These collaborations are helping to bridge the gap in access to credit, particularly in emerging markets, by providing more accurate and inclusive credit assessments

		ess of individuals who may not have traditional credit histories.	financial inclusion.	.
6.	Blockchain and AI Integration	The integration of AI with blockchain technology is creating new possibilities for secure, decentralized financial applications. AI can enhance blockchain networks by improving data processing, enhancing smart contracts, and predicting market trends.	Collaborations between AI companies and blockchain firms have led to the development of decentralized finance (DeFi) platforms that offer AI-driven lending, trading, and investment services.	The combination of AI and blockchain is driving innovation in the financial sector by enabling more secure, transparent, and efficient financial transactions and services.
7.	RegTech (Regulatory Technology)	AI is playing a critical role in RegTech by helping financial institutions comply with complex regulatory requirements through automated monitoring,	FinTech companies are collaborating with AI firms to develop solutions that can automatically scan and analyze legal texts,	These partnerships reduce the burden of regulatory compliance and help financial institutions avoid fines and penalties by ensuring

		reporting, and compliance management systems.	monitor transactions for compliance, and generate regulatory reports.	that they adhere to the latest regulations.
8.	InsurTech (Insurance Technology)	AI is being used in the insurance industry to automate underwriting, claims processing, and risk assessment. By analyzing large datasets, AI can more accurately predict risk and determine appropriate pricing for insurance products.	Partnerships between AI companies and insurance providers have led to the development of platforms that can process claims in minutes, assess risk profiles, and offer personalized insurance products based on customer data.	AI-driven innovations in InsurTech are improving efficiency, reducing costs, and providing customers with more accurate and personalized insurance offerings.
9.	Predictive Analytics for Market Forecasting	AI's ability to analyze vast amounts of data enables FinTech companies to predict market trends, asset prices, and economic	Collaborations between AI firms and investment banks have resulted in the development of AI-powered trading	Predictive analytics enhances decision-making in financial markets, allowing institutions to stay ahead of market

		conditions with greater accuracy. These insights are valuable for trading, investment, and financial planning.	algorithms that can predict market movements and execute trades based on real-time data.	trends and improve their investment strategies.
10.	Financial Inclusion and Microfinance	AI is being used to enhance financial inclusion by providing low-cost, accessible financial services to underserved populations. This includes microloans, mobile banking, and savings platforms that cater to low-income individuals.	FinTech companies are partnering with AI-driven platforms to offer microfinance solutions in developing countries, where traditional banking services are often unavailable or unaffordable.	These collaborations are helping to close the financial inclusion gap by providing accessible financial services to populations that were previously excluded from the formal financial system.

Source: Authors' compilation

 (iv) **Computer Vision**: This area allows machines to interpret and understand visual information from the world, such as images and videos. Using techniques like image recognition and object detection, computer vision systems can identify objects, track movements, and even understand scenes in ways similar to human vision.

(v) **Robotics**: Robotics combines AI with physical machines to create robots that can perform tasks autonomously or semi-autonomously. These robots range from industrial robots that do repetitive tasks on

assembly lines to autonomous vehicles that navigate complex environments.

2.2 The Adoption of AI-based Fintech in Nigerian Banks

In the mid-2010s, Nigerian banks began exploring AI-powered solutions to enhance their services, moving away from traditional methods like in-person banking, phone calls, and emails. These traditional channels, while somewhat effective, had significant drawbacks such as long wait times, limited availability outside banking hours, and high costs associated with maintaining large service teams. As digital banking gained momentum in Nigeria, driven by increased internet access and smartphone usage, banks sought innovative ways to improve services. AI, particularly through chatbots—AI programs designed to simulate human conversation—emerged as a promising solution, automating routine interactions, reducing operational costs, and providing 24/7 service.

Following the initial success of these chatbots, several major Nigerian banks quickly launched their own AI-powered Fintech. Over time, as banks became more comfortable with AI-based technology, they incorporated more sophisticated AI capabilities. These expanded beyond basic customer service tasks like answering FAQs and facilitating simple transactions, to more complex functions such as fraud detection, personalized banking, loan processing, and credit scoring.

Today, many Nigerian banks offer AI-based services across multiple platforms for various banking needs. For example, United Bank for Africa (UBA) uses "Leo" on Facebook Messenger, WhatsApp, and its official website for services like money transfers, bill payments, checking account balances, and general inquiries. Similarly, Union Bank of Nigeria offers "Leo" on WhatsApp and Facebook Messenger for basic banking tasks. Zenith Bank's "ZiVA" is available on WhatsApp, Facebook Messenger, and the bank's website, providing account services, money transfers, and customer service inquiries. First Bank of Nigeria's "FirstBank Chat Banking" and Guaranty Trust Bank's (GTBank) "Habari" and "GT Assistant" are also available on multiple platforms, facilitating a range of services from balance checks to money transfers. This demonstrates the widespread adoption and evolution of AI in Nigerian banking.

2.3 Empirical Review

Oyeniyi et al. (2024) explored how AI is transforming the banking sector, focusing on its broad impacts. They used a detailed thematic analysis and a comprehensive literature review to look at the evolution, current uses, and future potential of AI in banking. Their study highlighted AI's role in improving customer experience and operational efficiency. By using a mixed-methods approach, they provided a nuanced understanding of how AI is changing service delivery, risk management, and customer engagement. The findings emphasized AI's significant contributions to customer service and the rise of personalized banking experiences, while also stressing the need to address ethical and privacy concerns through ongoing research and development. Also, Darangwa (2021) examined the impact of AI on the South African banking industry, particularly in customer service, risk management, and fraud prevention. The study concluded that AI significantly boosts efficiency and security in banks but also pointed out potential downsides, such as increased unemployment and risks related to data manipulation.

Nnaomah et al. (2024) compared AI adoption in risk management between U.S. and Nigerian banks. They reviewed existing literature to evaluate the benefits and challenges of using AI to manage various risks, such as credit, market, operational, and compliance risks. The study found that U.S. banks have more advanced AI implementations in risk management, using sophisticated analytics and machine learning models. In contrast, Nigerian banks are in the early stages of AI adoption, facing challenges like limited technological infrastructure and regulatory constraints. Udeh et al. (2024) in their own view looked into how AI-enhanced fintech communication tools, especially chatbots and natural language processing (NLP), can improve banking support. Their study showed that AI-driven chatbots significantly enhance customer experience by reducing response times and providing accurate, helpful information. By automating routine inquiries, these technologies free up human agents to handle more complex tasks, improving operational efficiency and customer satisfaction. The study also highlighted AI's ability to provide valuable insights into customer behavior, enabling more personalized services.

Khan (2024) provided a comprehensive analysis of AI's transformative role in finance, detailing its impact on investment strategies, risk assessment, fraud detection, customer service, and regulatory compliance. The study highlighted AI's ability to process large datasets, extract actionable insights, and automate decision-making processes, while also emphasizing the need for ethical, privacy, and regulatory considerations in AI adoption. Also, Sheth et al. (2022)

examined the relevance of AI in emerging markets, focusing on its strategic role in personalizing banking experiences. Using an exploratory, inductive approach with in-depth interviews of financial experts, the study identified five key themes related to AI-mediated banking: the importance of operational capacity, user awareness, managerial and employee engagement, the necessity of human intervention due to demographic factors, and the development of personalized AI-driven banking services.

According to Zarkesh (2023), he investigated how AI-driven pricing strategies are being used by Iranian banks that offer health insurance and how these strategies affect customer churn. The study found that personalized pricing, made possible by AI, boosts customer loyalty and satisfaction. However, it also stressed the need for clear communication to ensure that customers understand how these AI-powered pricing mechanisms work. In the work of Atadoga et al. (2024), he provided an in-depth review of how AI is transforming the U.S. banking sector. They focused on how AI technologies are revolutionizing various banking operations. By pulling together industry reports, academic literature, case studies, and expert interviews, the review gave a detailed look at AI's role in improving operational efficiency, customer service, and risk management. The findings highlighted AI's effectiveness in automating routine tasks, enhancing decision-making, and detecting fraudulent activities. It also emphasized AI's role in regulatory compliance and innovations in customer service, like chatbots and virtual assistants.

Benjamin et al. (2024) investigated how AI is being strategically used to drive financial process innovation in Nigerian commercial banks. As AI adoption speeds up globally, especially in the banking sector, understanding its impact on operational efficiency, innovation, and customer experience is crucial. The study used statistical techniques like means, standard deviations, and t-tests to analyze the relationship between AI adoption and financial process innovation, finding a significant positive influence of AI on financial process innovation in Nigerian banks.

Sampat et al. (2024) explored the challenges of integrating fintech in Nigeria, focusing on customer vulnerability, technical issues, and regulatory gaps. Through interviews with fintech developers, the study highlighted obstacles like poor technological infrastructure and data management challenges that hinder fintech adoption. The findings also raised ethical concerns about the lack of privacy control and the shortage of skilled developers.

3. Methodology

This study uses a quantitative approach to analyse the technical efficiency of Nigerian banks based on AI-driven technologies. It employs a non-parametric method called Data Envelopment Analysis (DEA) to measure the efficiency levels of these banks. The analysis is based on secondary data from financial statements, regulatory filings, and databases covering the period from 2019 to 2022. This timeframe was chosen to capture the growth of FinTech and AI technologies, as well as significant financial reforms in Nigeria, allowing for a comprehensive examination of their enhanced improvement on bank efficiency over time.

The study focuses on six major banks listed on the Nigerian Stock Exchange: FCMB, Zenith, Access, GTB, UBA, and Union. These banks were selected because of their significant investments in AI-based technologies. In the DEA analysis, the inputs are defined as the costs of Information and Communication Technology (ICT) and total equity, while the outputs include total deposits and net interest income.

The study uses the DEA-BCC model (developed by Banker, Charnes, and Cooper in 1984), which aims to minimize inputs for given outputs under Variable Returns to Scale (VRS). Efficiency is measured by a score, θ, where θ is less than or equal to 1. Banks on the efficiency frontier are considered technically efficient, while those below the frontier are deemed inefficient, with efficiency scores ranging from 0 to 1.

The DEA model is represented as follows (Coelli et al., 2005):

$$\min{}_{\theta, \lambda} \theta$$

$$s.t. -y_i + Y\lambda \geq 0 \quad \text{................................(1)}$$

$$\theta x_i - X\lambda \geq 0 \quad \text{................................(2)}$$

$$\lambda \geq 0 \quad \text{..............................(3)}$$

Here, λ is a N×1 vector of constants, and θ is a scalar. The technical efficiency score for a specific bank is denoted by the value of θ. It will satisfy $\theta \leq 1$, where a value of 1 indicates a frontier point and hence a technically efficient bank. The degree of potential inefficiencies is indicated by the value of $\theta \leq 1$.

Analysis And Results

This section presents the technical efficiency scores of the selected Nigerian banks from 2019 to 2022, calculated using DEAP Version 2.1(DEA solver)

Table 2: Technical Efficiency Scores of the banks

BANKS/YEARS	2019	2020	2021	2022	MEAN SCORES
ACCESS BANK	1.00	1.00	1.00	1.00	1.00
FCMB	1.00	1.00	1.00	1.00	1.00
GTB	1.00	0.883	1.00	1.00	0.971
UBA	0.955	1.00	1.00	1.00	0.989
UNION BANK	1.00	0.977	1.00	1.00	0.994
ZENITH BANK	1.00	1.00	0.585	1.00	0.896
MEAN SCORES	0.993	0.997	0.931	1.00	

Source: Extract of the results from DEAP Version 2.1

Table 2 shows the technical efficiency scores for the banks from 2019 to 2022, evaluating how AI-based technologies improved their operational performance. These scores range from 0 to 1, with 1 indicating full technical efficiency, meaning the bank is using its resources optimally without any waste. For a deeper analysis, these scores are interpreted in the context of both national and global financial trends each year.

In 2019, most banks, including Access Bank, FCMB, GTB, Union Bank, and Zenith Bank, achieved a perfect technical efficiency score of 1.00, indicating they were fully efficient in their operations. UBA had a slightly lower score of 0.955, suggesting some minor inefficiencies. The high efficiency levels across most banks reflect a stable period for Nigerian banks, largely unaffected by major financial disruptions. Globally, 2019 saw moderate economic growth, with many banks focusing on digital transformation and the early adoption of AI-based solutions to enhance operational efficiency. In Nigeria, the Central Bank of Nigeria (CBN) was actively promoting financial inclusion and technological innovation in the banking sector, creating a favorable environment for banks to optimize their processes and adopt new technologies like AI.

Figure 2: Mean Technical Efficiency Scores of the Banks

MEAN TECHNICAL EFFICIENCY SCORES OF THE BANKS

(2019: 0.997, 2020: 0.997, 2021: 0.93, 2022: 1)
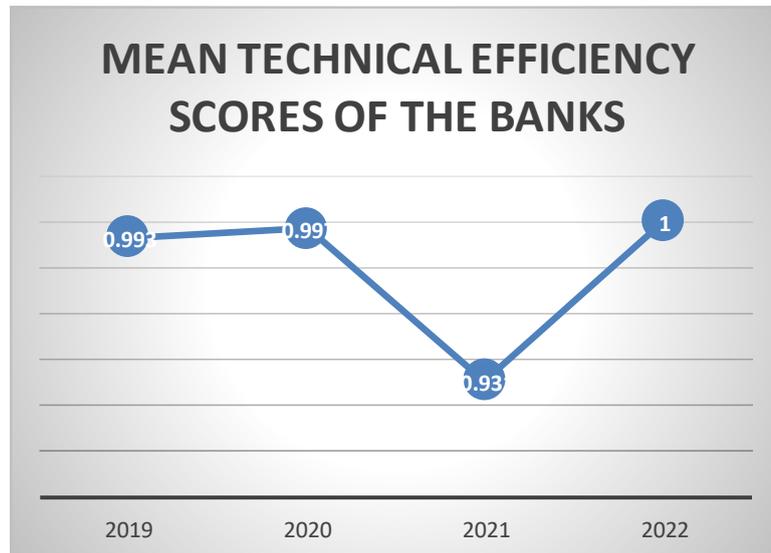
Source: Authors' design

The year 2020 brought significant challenges globally and locally due to the COVID-19 pandemic. This crisis led to economic slowdowns, disruptions in business activities, and a shift towards digital banking services. Despite these hurdles, four banks—Access Bank, FCMB, UBA, and Zenith Bank—maintained a perfect efficiency score of 1.00. This indicates that these banks adapted quickly to the changing environment, using AI-based solutions to maintain operational efficiency and handle increased digital interactions.

However, GTB and Union Bank saw declines in efficiency, with scores of 0.883 and 0.977, respectively. GTB's drop to 0.883 could be due to the sudden need to rapidly scale digital services during the pandemic, highlighting challenges in managing this transition or effectively integrating AI solutions under pressure. Union Bank's minor decrease suggests some inefficiencies, though less pronounced than GTB's. Overall, the mean efficiency score remained high at 0.997, reflecting a resilient banking sector despite the global economic downturn.

In 2021, the global financial landscape was still recovering from the pandemic, with varying degrees of economic uncertainty. Most banks—Access Bank, FCMB, GTB, UBA, and Union Bank—achieved full

efficiency, showing resilience and effective adaptation to ongoing challenges. However, Zenith Bank's efficiency score dropped significantly to 0.585, indicating major operational issues. This decline could be linked to ongoing disruptions from the pandemic, difficulties in technological integration, or strategic missteps. The overall mean efficiency score fell to 0.931, reflecting the impact of Zenith Bank's inefficiency on the sector's average performance.

By 2022, the global economy began to stabilize, and banks had adjusted to the new normal with better resilience and refined strategies. All banks achieved full technical efficiency, scoring 1.00. This widespread return to full efficiency indicates that banks had effectively adapted to the post-pandemic environment, successfully integrating AI-based solutions and optimizing their operations. The mean efficiency score reached 1.00, suggesting that the sector as a whole had overcome previous disruptions and achieved optimal operational performance.

Conclusion

The analysis of technical efficiency scores of the banks from 2019 to 2022 highlights the significance of AI-based technologies amid varying national and global financial challenges. The findings show that AI-powered solutions have been key factors in improving the performance of Nigerian banks. Despite challenges like the COVID-19 pandemic, most banks managed to stay efficient, with many reaching full efficiency by 2022. Banks such as Access Bank, FCMB, UBA, and Zenith Bank showed strong adaptability, using AI to maintain smooth operations during tough times. Although GTB and Union Bank saw temporary drops in efficiency, they quickly bounced back, reflecting the overall sector's ability to integrate technology and adjust to change. The study highlights the crucial role of AI in helping banks run efficiently and suggests that ongoing investment in AI will be essential for the future growth of Nigeria's banking industry.

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APPENDICES

Banks Inputs and Outputs used for DEA

BANKS	INPUTS & OUTPUTS	2019	2020	2021	2022
ACCESS	NET INTEREST INCOME	232,760,371	198,274,706	192,238	224,828

	TOTAL DEPOSIT	4,747,624,225	5,664,376,827	6,939,776	9,167,380
	TOTAL EQUITY	539,488,038	653,895,666	871,450	1,068,667
	ICT COST	8,107,826	15,466,830	17,949	33,879
GTB	NET INTEREST INCOME	189,318,029	208,932,503	259,303,127	220,612,622
	TOTAL DEPOSIT	2,086,825,270	2,881,698,791	4,130,333,130	4,610,343,166
	TOTAL EQUITY	605,889,596	702,399,525	137,639,949	137,951,519
	ICT COST	2,167,869	4,117,573	147,609	34,504
UBA	NET INTEREST INCOME	150,853	158,227	186,915	217,305
	TOTAL DEPOSIT	2,860,388	3,824,143	4,448,306	5,900,514
	TOTAL EQUITY	446,522	477,940	501,601	585,193
	ICT COST	5,690	6,027	7,675	8,736
ZENITH	NET INTEREST INCOME	213,073	240,381	257,670	295,155
	TOTAL DEPOSIT	3,486,887	4,298,258	5,169,199	7,434,806
	TOTAL EQUITY	778,995	905,232	1,049,775	1,195,147
	ICT COST	1,980	2,103	27,540	27,662
FCMB	NET INTEREST INCOME	427,608	418,881	433,307	559,456
	TOTAL DEPOSIT	943,085,581	1,257,130,907	1,715,160,539	2,069,274,028
	TOTAL EQUITY	131,939,461	132,227,355	134,342,829	137,646,475

	ICT COST	5,690	6,721	8,536	14,332
UNION	NET INTEREST INCOME	51,685	56,896	44	59
	TOTAL DEPOSIT	886,328	1,135,134	1,356	1,475
	TOTAL EQUITY	231,192	247,521	267	297
	ICT COST	4,174	5,816	6,606	8,035

MEAN TECHNICAL EFFICIENCY SCORES OF THE BANKS

2019	2020	2021	2022
0.993	0.997	0.931	1
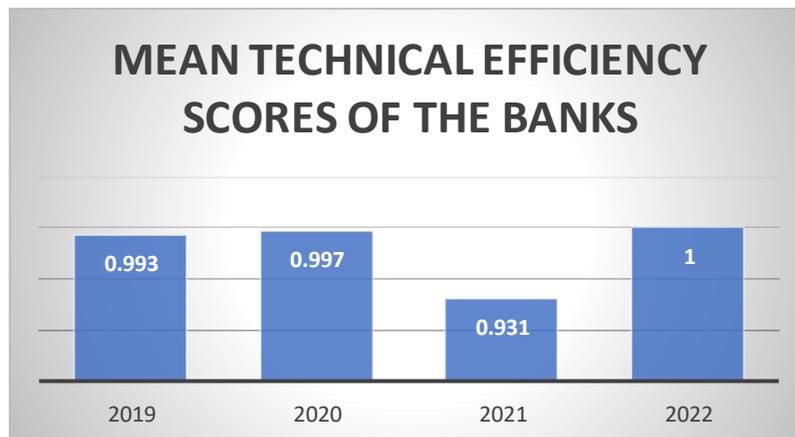
Results from DEAP Version 2.1

2019
EFFICIENCY SUMMARY:

firm crste vrste scale

```
1  1.000  1.000  1.000  -
2  1.000  1.000  1.000  -
3  0.875  1.000  0.875 irs
4  0.807  0.955  0.844 irs
5  0.438  1.000  0.438 irs
6  1.000  1.000  1.000  -
```

mean 0.853 0.993 0.860

Note: crste = technical efficiency from CRS DEA
    vrste = technical efficiency from VRS DEA
    scale = scale efficiency = crste/vrste

2020

EFFICIENCY SUMMARY:

firm crste vrste scale

1 1.000 1.000 1.000 -
2 1.000 1.000 1.000 -
3 0.750 0.883 0.849 irs
4 1.000 1.000 1.000 -
5 0.532 0.977 0.544 irs
6 1.000 1.000 1.000 -

mean 0.880 0.977 0.899

2021

EFFICIENCY SUMMARY:

firm crste vrste scale

1 0.857 1.000 0.857 drs
2 1.000 1.000 1.000 -
3 1.000 1.000 1.000 -
4 1.000 1.000 1.000 -
5 0.169 1.000 0.169 irs
6 0.505 0.585 0.863 drs

mean 0.755 0.931 0.815

2022

EFFICIENCY SUMMARY:

firm	crste	vrste	scale	
1	0.730	1.000	0.730	drs
2	1.000	1.000	1.000	-
3	1.000	1.000	1.000	-
4	1.000	1.000	1.000	-
5	0.149	1.000	0.149	irs
6	0.572	1.000	0.572	drs
mean	0.742	1.000	0.742	