



THE INFLUENCE OF TECHNOLOGICAL INNOVATION ON THE PERFORMANCE OF COMMERCIAL BANKS IN SOUTH SUDAN

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ABSTRACT

The commercial banking sector in South Sudan faces significant challenges, including political instability, economic uncertainty, high inflation (exceeding 60% in 2020), and inadequate infrastructure, which collectively limit financial access and trust. In 2020, less than 20% of adults had bank accounts, highlighting a considerable gap in financial inclusion. While existing research extensively focuses on developed economies, there remains a critical gap in understanding how strategic factors, particularly technological innovation, influence banking performance in challenging environments like South Sudan. This study aimed to examine the influence of key strategic implementation drivers on the performance of commercial banks in South Sudan, with a specific objective to establish the impact of technological innovation.

Utilizing an explanatory research design, the study analyzed variables without manipulation, targeting all 30 licensed commercial banks in South Sudan. Data was collected through structured questionnaires, which underwent validity and reliability tests prior to deployment. Findings were summarized using descriptive statistics, and relationships were assessed using binary logistic regression via SPSS version 25, with results presented in tables and charts. The study confirmed that technological innovation is a major driver of bank performance, significantly enhancing operations through digital banking, mobile banking, and automated systems. However, challenges persist, including system reliability, regulatory constraints, and employee training gaps. Based on these findings, it is recommended that regulators and policymakers develop frameworks that promote technological innovation, ensure system reliability and cybersecurity, and address employee training needs, while bank executives enhance digital banking infrastructure for sustainable financial growth.

KEY WORDS: *Technological Innovation, performance, Commercial Banks in South Sudan*

INTRODUCTION

The performance of commercial banks is a critical area of inquiry globally, directly impacting economic growth, financial stability, and the overall health of the banking sector. In Europe, the banking landscape has shown significant fluctuations, with the European Banking Authority (EBA, 2021) reporting a rebound in return on equity (ROE) from 2.31% in 2020 to 9.29% by 2023. Similarly, commercial banks in the United States have demonstrated resilience, achieving a record average profitability in 2021, with return on assets (ROA) reaching 1.29%. Globally, strategic key implementation drivers, such as technological innovation, are recognized for their significant role in performance improvements.

In Africa, the banking sector is projected to grow substantially, driven by innovations in digital banking and financial inclusion initiatives (McKinsey & Company, 2020). However, it faces persistent challenges, including economic volatility, currency fluctuations, and complex regulatory environments (Akpan et al., 2019). The banking sector in South Sudan is particularly crucial for the country's economic development, despite operating under extremely



challenging conditions. These challenges include ongoing political instability, economic uncertainty, and underdeveloped infrastructure, which impede growth and performance. Factors such as limited access to capital markets, weak regulatory frameworks, and frequent currency fluctuations further exacerbate difficulties for commercial banks Amum (2020). For instance, in 2020, less than 20% of South Sudan's adult population had access to formal banking services, and inflation rates exceeded 60%, negatively impacting bank profitability and customer satisfaction.

Despite these constraints, some banks in South Sudan have shown resilience through initiatives focused on financial inclusion and microfinance, bridging service gaps for rural populations (Garang, 2022). Donor-funded programs have also contributed to capacity building, improving operational efficiency (International Monetary Fund, 2021). However, existing research primarily focuses on developed economies with established financial systems, leaving a notable gap in understanding how commercial banks in South Sudan, facing significant socio-economic and political constraints, can leverage strategic drivers to enhance their performance. Specifically, the adaptation and efficacy of technological advancements like mobile banking in South Sudan remain underexplored. This study aims to address this critical knowledge gap by exploring the influence of strategic key drivers, specifically technological innovation, on the performance of South Sudanese commercial banks.

Theory and Hypothesis

This study draws upon several theoretical perspectives to understand the influence of technological innovation on the performance of commercial banks. The Resource-Based View (RBV) theory posits that organizations achieve sustained competitive advantage by acquiring and deploying valuable, rare, inimitable, and non-substitutable resources, among which technological innovations are crucial (Barney, 1991). In banking, the adoption of digital platforms, automated systems, and mobile banking solutions enhances operational efficiency, reduces transaction costs, and improves service delivery, thereby providing a competitive edge.

Building on RBV, the Dynamic Capabilities Theory emphasizes the necessity for organizations to adapt and reconfigure their technological resources in response to changing market demands (Teece et al., 1997). In volatile environments like South Sudan, leveraging technological advancements enables banks to effectively respond to economic uncertainties and enhance resilience by adopting technologies such as blockchain for secure transactions or artificial intelligence for personalized services.

Furthermore, the Innovation Diffusion Theory (IDT), introduced by Everett Rogers (1962), provides a framework for understanding the adoption of new ideas and technologies within organizations. IDT highlights that the success of adoption depends on the innovation's perceived relative advantage, compatibility with existing systems, complexity, trialability, and observability. In the context of this study, technological innovation—such as digital banking, mobile banking, and automated transaction systems—aligns with IDT by demonstrating how the successful diffusion of these innovations can significantly impact the overall performance of commercial banks in South Sudan.

Based on these theoretical underpinnings and the established positive relationship between technological advancements and banking performance in existing literature, the study sought to test the following null hypothesis:
H₀₁: Technological innovation has no statistically significant influence on the performance of commercial banks in South Sudan.

Data Methods

The study adopted a descriptive research design, which was deemed appropriate for systematically describing the existing relationships between strategic implementation drivers and the performance of commercial banks in South Sudan without manipulating variables. This design allowed for the collection of quantitative data to capture respondents' perceptions, attitudes, and experiences related to technological innovation. Its justification lies in its ability to provide a clear, accurate, and factual account of the phenomenon in a real-world context, particularly beneficial given the operational context of South Sudan's banking sector.

The target population comprised all 30 licensed commercial banks operating in South Sudan as per the Bank of South Sudan (2022). This included national, joint venture, and foreign commercial banks. Data was collected from



respondents across three management tiers: top, middle, and lower, to ensure a comprehensive representation of the organizational hierarchy.

A census sampling technique was employed to include all 30 banks in the study, ensuring comprehensiveness and representativeness given the relatively small population. Within each bank, purposive sampling was used to select three respondents—one from each management level (top, middle, and lower)—totaling a target of 90 respondents. This approach ensured diverse perspectives across institutional types and hierarchical levels.

For data analysis procedures, collected questionnaires were checked for completeness and data cleaned. Responses were coded and entered into Statistical Package for the Social Sciences (SPSS) version 25 for quantitative analysis. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were computed to summarize the data. Inferential statistics, specifically Pearson correlation and multiple regression analyses, were applied to examine relationships. A binary logistic regression model was also utilized to assess the influence of strategic implementation drivers on bank performance. Diagnostic tests for normality (Shapiro-Wilk test, histograms, Q-Q plots), multicollinearity (Variance Inflation Factor < 10), and homoscedasticity (Breusch-Pagan test) were conducted to ensure the reliability and validity of the regression model assumptions.

Data Collection Instruments

The primary research instrument for data collection was structured questionnaires. These were chosen for their efficiency in gathering large amounts of data, their ability to maintain consistency across respondents, and their suitability for collecting quantitative data aligned with the study's objectives. The use of a Likert-scale format allowed for the measurement of attitudes and perceptions, and the structured format ensured anonymity, encouraging honest responses.

To ensure the validity and reliability of the questionnaires, a pilot test was conducted with 10% of the study sample (9 respondents) from commercial banks in Nimule. This pre-test helped identify ambiguities and refine questions for clarity and appropriateness. Content validity was ensured through review by subject matter experts and supervisors, while face validity focused on clarity and appropriate structuring. Construct validity was maintained by aligning questions with relevant theoretical frameworks. For reliability testing, Cronbach's alpha was used, with a coefficient above 0.70 indicating acceptable internal consistency.

Data collection procedures involved obtaining necessary research permits from relevant authorities in South Sudan, including the Bank of South Sudan and Kenya Methodist University's ethical review committee, alongside NACOSTI. An introductory letter from the researcher's institution was provided to establish credibility. Principles of voluntary participation, confidentiality, and anonymity were rigorously upheld; participants were fully informed about the study's objectives, and their right to withdraw was emphasized. Data was collected using the drop-and-pick method and securely stored to maintain privacy, in line with GDPR guidelines.

DATA ANALYSIS

Descriptive Statistics for Technological Innovation

Descriptive analysis for technological innovation in the banking sector was done to provide insights on the user-friendliness of digital banking services, the extent of mobile banking adoption, the efficiency of automated transaction systems, and the impact of technological innovations on banking operations. It also covers aspects of employee training in technological tools and the adequacy of banking technology in meeting market demands.



Table 1.
Descriptive Statistics for Technological Innovation

Statement	SD	D	N	A	SA	Mean	Std Dev.
	F (%)	F (%)	F (%)	F (%)	F (%)		
Our digital banking services are user-friendly and efficient.	5 (5.8%)	6 (7.0%)	21 (24.4%)	30 (34.9%)	24 (27.9%)	3.72	1.12
Mobile banking adoption among customers is widespread.	3 (3.5%)	11 (12.8%)	23 (26.7%)	31 (36.0%)	18 (20.9%)	3.58	1.07
Automated transaction systems operate smoothly and without frequent issues.	2 (2.3%)	8 (9.3%)	33 (38.4%)	20 (23.3%)	23 (26.7%)	3.63	1.05
Technological innovations have significantly improved our banking operations.	3 (3.5%)	13 (15.1%)	25 (29.1%)	27 (31.4%)	18 (20.9%)	3.51	1.09
I receive adequate training on new technological tools and systems.	4 (4.7%)	11 (12.8%)	29 (33.7%)	21 (24.4%)	21 (24.4%)	3.51	1.13
The technology used in our bank meets the current market demands.	3 (3.5%)	11 (12.8%)	27 (31.4%)	22 (25.6%)	23 (26.7%)	3.59	1.12

Source: Researcher, (2025).

The results indicate that digital banking services are perceived as user-friendly and efficient, with a mean score of 3.72 and a standard deviation of 1.12. 62.8% of respondents agreed or strongly agreed with this, aligning with findings by Haabazoka (2018) that technological improvements positively influenced financial performance in Zambia's banking Sector. However, 24.4% remained neutral, suggesting room for further refinement in user experience and accessibility.

Mobile banking adoption was considered widespread by 56.9% of respondents (mean 3.58, SD = 1.07), although 16.3% expressed reservations. This aligns with Wuoi Jacob Mach et al. (2023), who found mobile banking significantly influences performance in South Sudan but is hindered by regulatory and infrastructural challenges. The mixed perception indicates barriers like digital literacy and network coverage still need to be addressed.

Automated transaction systems were perceived as operating smoothly by 50% of respondents (mean 3.63, SD = 1.05), but a significant 38.4% remained neutral, indicating that technical challenges or maintenance concerns might exist. This supports findings by Wanalo, Mande, and Ng'ong'a (2020) on efficiency improvements alongside potential technical issues.

The overall impact of technological innovations significantly improving banking operations was agreed upon by 52.3% of respondents (with a mean score of 3.5 and a standard deviation of 1.09). However, 18.6% disagreed indicating some concerns regarding the effectiveness of certain innovations. This is consistent with research carried out by Chen and Lee (2019), whose findings indicated that fintech innovations including digital banking and block chain technology, have improved financial performance but require regulatory support for effective implementation. Challenges related to integration and customer adaptability remain pertinent.

Regarding adequate training on new technological tools and systems, 48.8% of respondents agreed, but 33.7% remained neutral, and 17.5% disagreed, pointing to gaps in training programs. This aligns with Deng (2023), who emphasized the importance of continuous employee training.

Finally, the adequacy of banking technology in meeting current market demands received a mean score of 3.59 and a standard deviation of 1.12 with 52.3% of respondents agreeing or strongly agreeing. These findings are consistent with research by Smith (2018), which found that banks investing in innovative technologies experienced higher profitability and customer satisfaction. However, the remaining percentage remained neutral or disagreed indicating



some concerns about the adaptability of banking technology. This suggests that while technological advancements are occurring, continuous assessment of market trends and responsiveness to customer expectations are necessary to maintain competitiveness.

Descriptive Statistics on Performance of Commercial Banks

This analysis highlights the key performance indicators such as return on assets, profitability growth, customer base expansion, financial performance relative to industry benchmarks, the impact of effective strategies, and the accuracy of performance metrics. These indicators signify the overall financial health and operational efficiency of commercial banks.

Table 2.
Descriptive statistics for Performance of Commercial Banks

Statement	SD (%)	F (%)	D (%)	F (%)	N (%)	F (%)	A (%)	F (%)	SA (%)	F (%)	Mean	Std Dev.
Our bank's return on assets is consistently strong.	4 (4.7%)	12 (14.0%)	21 (24.4%)	26 (30.2%)	23 (26.7%)	3.60	1.16					
We have seen a steady growth in profitability over the past year.	3 (3.5%)	13 (15.1%)	22 (25.6%)	31 (36.0%)	17 (19.8%)	3.53	1.08					
Our customer base has expanded significantly in recent years.	4 (4.7%)	9 (10.5%)	25 (29.1%)	25 (29.1%)	23 (26.7%)	3.63	1.13					
The bank's financial performance meets or exceeds industry benchmarks.	3 (3.5%)	12 (14.0%)	22 (25.6%)	29 (33.7%)	20 (23.3%)	3.59	1.10					
Effective strategies have led to noticeable improvements in our bank's performance.	4 (4.7%)	12 (14.0%)	22 (25.6%)	23 (26.7%)	25 (29.1%)	3.62	1.18					
The performance metrics accurately reflect our bank's operational success.	3 (3.5%)	9 (10.5%)	23 (26.7%)	30 (34.9%)	21 (24.4%)	3.66	1.07					

Source: Researcher, (2025).

Table 3.
Correlation between technological Innovation and Performance of Commercial Banks

	Performance of Commercial Banks (Y)	Technological Innovation (X)
Pearson Correlation	1	.838 **
Performance of Commercial Banks (Y)		
Sig(2-tailed)		.000
N	114	114
Technological Innovation (X)		
Pearson Correlation	.838 **	1
Sig(2-tailed)	.000	
N	114	114

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

The correlation analysis between the performance of commercial banks and strategic technological innovation (X1) yielded a Pearson correlation coefficient of $r = 0.838$, $p < 0.01$. This indicates a very strong and statistically significant positive relationship, suggesting that higher adoption and effective utilization of technological innovations are strongly associated with improved bank performance. This finding aligns with Wanalo, Mande, and Ng'ong'a (2020), who demonstrated that technological innovations significantly enhanced financial performance in Kenyan commercial banks. In the context of South Sudan, this strong correlation underscores the substantial potential of carefully selected and context-appropriate technologies to improve operational efficiency, customer reach, and profitability despite infrastructural and regulatory limitations.



Furthermore, the overall multiple linear regression model combining all strategic implementation drivers, including technological innovation, showed an R-squared (R^2) value of 0.954, meaning that 95.4% of the variation in bank performance can be collectively explained by these predictors. This high explanatory power suggests that technological innovation, alongside other strategic drivers, is a strong determinant of bank performance in South Sudan, reinforcing the importance of integrated strategic management approaches in dynamic and high-risk markets.

Regression Analysis; Hypothesis Testing

H_{01} : Technological innovation has no statistically significant influence on the performance of commercial banks in South Sudan.

Binary Logic Regression

Table 4: Binary Logic Regression

		Chi-square	df	Sig.
Step 1	Step	89.147	4	.000
	Block	89.147	4	.000
	Model	89.147	4	.000

The Chi-square statistic for the model is 89.147 with 4 degrees of freedom, and the associated p-value is .000, indicating that the model is statistically significant.

Table 5
Model Summary for Strategic Implementation Drivers

Step	-2 log likelihood	Cox and Snell R Square	Nagelkerke R square
1	13.581 ^a	.543	.913

^a Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

The -2 Log Likelihood value of 13.581 indicates a good fit of the model to the observed data, with smaller values suggesting better fit. The Cox & Snell R Square value is .543, while the Nagelkerke R Square is .913, indicating that the model explains approximately 91.3% of the variance in the performance of commercial banks.

Variables in the equation for strategic Implementation drivers

Table 6:
Variables in the Equation

Step 1 ^a	Technological Innovation	B	S.E.	Wald	df	Sig	Exp(B)
		4.662	2.189	4.534	1	.033	105.877

Table 6 presents the regression coefficients, standard errors, Wald statistics, significance values, and odds ratios Exp(B) for Technological Innovation in the logistic regression model. Technological innovation shows the strongest effect ($B = 4.662$, $p = .033$) with an odds ratio of 105.877, indicating that improvements in technological innovation are associated with a more than 100-fold increase in the odds of high performance.

Table 7:
Model Summary for Hypothesis

Model R	R Square	Adjusted R Square	Std. Error of the Estimate
.847 ^a	.718	.715	.45839

a. Predictors: (Constant), Technological Innovation

The model summary shows a strong correlation ($R = 0.847$) between technological innovation and bank performance, with an R^2 of 0.718, meaning technological innovation explains 71.8% of the variation in performance.

**ANOVA for hypothesis**

Model	Sum of Squares	df	Mean Square	F	Sig
Regression	59.794	1	59.794	284.577	.000
Residual	23.533	112	210		
Total	83.327	113			

a. Dependent Variable: Performance of Commercial Banks

b. Predictors: (Constant), Technological Innovation

The ANOVA results ($F = 284.577$, $p < 0.001$) indicate that the model is statistically significant.

Lastly, the unstandardized beta coefficient (B) for technological innovation was 0.845, with a p -value < 0.001 . This positive and statistically significant coefficient suggests that for every one-unit increase in technological innovation, bank performance is estimated to increase by 0.845 units.

Based on these compelling results, the null hypothesis (H_0) is decisively rejected. The findings confirm that technological innovation has a statistically significant and positive influence on the performance of commercial banks in South Sudan. This underscores the critical role of advancements like digital banking, mobile banking, and automated systems in driving efficiency, customer satisfaction, and profitability within the country's banking sector.

SUMMARY OF THE FINDINGS, CONCLUSION, RECOMMENDATIONS, AREAS OF FURTHER RESEARCH

The study found that there is a strong and statistically significant positive correlation ($r = 0.825$, $p = 0.000$) between technological innovation and bank performance. In the multiple linear regression, technological innovation also showed a positive and significant relationship ($\beta = 0.112$, $p = 0.005$) with bank performance. Furthermore, hypothesis testing explicitly rejected the null hypothesis, confirming that technological innovation significantly influences bank performance in South Sudan. In binary logistic regression, technological innovation showed the strongest effect ($B = 4.662$, $p = .033$) with an odds ratio of 105.877, indicating that improvements in technological innovation are associated with a more than 100-fold increase in the odds of high performance.

Despite its potential, technological innovation in South Sudan faces unique challenges, including an underdeveloped financial infrastructure, political instability, currency volatility, regulatory limitations, and governance issues. The absence of advanced AI systems is also noted as a challenge.

In conclusion, technological innovation is a critical driver of bank performance in South Sudan, demonstrating a strong and statistically significant positive correlation. The adoption of digital banking services, mobile banking, and automated transaction systems has improved banking operations and customer convenience. However, the full potential of these advancements is limited by challenges such as system reliability, regulatory requirements, and gaps in employee training. To maximize impact, banks need to invest in continuous technological improvements, enhance digital infrastructure, and provide comprehensive training to employees to ensure seamless integration and expanded financial inclusion.

It was recommended that since technological innovation influences bank performance in South Sudan, banks should invest in regular technology upgrades and provide extensive training to employees to ensure effective utilization of digital banking tools. Additionally, regulators and policymakers to formulate and enforce policies that promote the adoption of technological innovations in the banking sector. This includes creating a conducive environment for fintech adoption while ensuring cybersecurity and data protection.

The study found that technological innovation became significant predictor of Bank Performance in an environment with a regulatory framework. Future research could explore how regulatory frameworks influence the effectiveness of fintech adoption, cybersecurity measures, and digital banking expansion. This would address the identified gap concerning the impact of regulatory frameworks on technology adoption in South Sudan's banking sector.



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