

FINANCIAL INNOVATIONS AND COST EFFICIENCY OF COMMERCIAL BANKS IN KENYA

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ABSTRACT

Kenyan commercial banks have adopted various innovations, yet challenges in optimizing costs under inflationary pressures persist. This study examined the effect of financial innovations on the cost efficiency of commercial banks in Kenya. The specific objectives were: to establish the effect of system innovations on cost efficiency of commercial banks in Kenya; to analyze the effect of product innovations on cost efficiency of commercial banks in Kenya. The study was anchored in the Transaction Cost Theory and Innovation Diffusion Theory. The study targeted a census of all 39 commercial banks licensed by the Central Bank of Kenya and employed a descriptive research design with an explanatory approach. Secondary data were extracted from CBK reports and bank financial statements spanning 2020 to 2024, supplemented by primary data from structured questionnaires administered to 68 respondents (response rate: 87.18%). Inferential analysis utilized multiple linear

regression models alongside Pearson's product-moment correlation coefficients, while means and standard deviations supported descriptive evaluation. Correlation outcomes reflected moderate negative relationships with cost efficiency: system innovations displayed the strongest link ($r = -0.470$) and product innovations ($r = -0.312$). The GLS regression findings showed that product innovations had a negative influence on cost efficiency ($\beta = -0.032$, $p = 0.003$). In conclusion, adopting product and system innovations enhanced cost efficiency in commercial banks. Consequently, the study recommends that banks prioritize system innovations.

Key words: Financial Innovation, Product Innovation, System Innovation.

INTRODUCTION

Background of the Study

The banking industry in Kenya offers a striking illustration of how Cost Efficiency is impacted by financial innovation. The financial landscape has changed as a result of the broad use of mobile money platforms like M-Pesa, which allow banks to provide services to a larger clientele at a significantly lower cost than traditional banking according to Kombe (2023). In addition to increasing financial inclusion, this has made it possible for banks to simplify their operations and lessen their dependency on pricey branch networks.

Financial innovation is intricate including the creation of new financial services, products and processes according to Lerner, Seru, Short and Sun (2021). Further, Product Innovation (PI) may include developing new financial instruments or investment vehicles. System Innovation (SI) is the creation of new platforms or financial infrastructure, such as mobile payment systems (Broby, 2021).

According to Hausmann *et al.* (2024), countries around the world have unique trends in Product Innovation and China and the USA are leading the way in biotechnology and AI. In the UK, special attention is given to financial technology and the creative industries. South Africa and Kenya, among other emerging economies, are helping innovation in areas like

mobile money and fintech that are useful locally (Hausmann *et al.* 2024). They make it clear to consider each nation's situation and abilities when studying worldwide innovation trends.

The Global SI trends indicate that the ways regions work vary (Dutta, Lanvin, Wunsch-Vincent & León, 2022). The USA and Europe are focusing on making advanced technologies by investing heavily in research and development, while Asia and China are leading the way in System Innovation. According to Dutta, Lanvin, Wunsch-Vincent and León (2022), despite its many obstacles, Africa is seeing an increase in innovation in fields like fintech and mobile money due to local demands and a growing entrepreneurial ecosystem. The potential of System Innovation to promote financial inclusion and economic development in emerging markets is demonstrated by Kenya, which has emerged as a center for mobile money innovation.

Statement of the Problem

The banking industry makes a substantial contribution to the nation's output with financial services contributing roughly 40% of Kenya's Gross Domestic Product (GDP) (Central Bank of Kenya [CBK], 2023). The profitability and stability of the industry are directly impacted by how well resources are allocated and risks are managed, making cost effectiveness a critical performance indicator (Kamau and Were, 2022). Additionally, banking operations have been transformed by financial innovation, which has improved accessibility and service delivery, especially in the areas of digital banking, mobile payments and automated services (Otieno *et al.* in 2023). Concerns concerning their direct effects on cost effectiveness and operational performance are raised by the growing focus on technology-driven banking solutions.

The banking industry's performance trends show both improvements and difficulties in terms of financial efficiency. According to data from the CBK (2023), the sector's overall Return on Assets (ROA) increased from 23.4% in 2021 to 31.1% in 2023, demonstrating increased profitability. Better operational efficiency is also indicated by the fact that cost-to-income ratios have decreased from 52% in 2020 to 48% in 2023. But inconsistent performance patterns continue, especially in Non-Performing Loans (NPLs), which were at 13.3% in 2023 and lending margins, indicating ongoing credit risks. There is a clear link between financial technology and operational performance, as evidenced by the growing trend in cost efficiency along with the expansion of digital adoption. Despite these advances, there are still unresolved methodological, conceptual, contextual and geographic gaps. The changing digital landscape may not be adequately captured by the traditional efficiency measurement models used in previous studies. Theoretical ambiguities result from the paucity of research conceptually connecting financial technology to cost effectiveness. The majority of research, contextually, concentrates on profitability rather than bank cost structures. Research on geography has mostly focused on big commercial banks, ignoring the cost dynamics of smaller banks that operate in rural regions. Filling in these gaps gave a thorough grasp of how Kenya's banking industry is changing.

General Objective

To examine the effect of financial innovations on the cost efficiency of commercial banks in Kenya.

Specific Objectives

The objectives of the study:

- i. To determine the effect of product innovation on cost efficiency of commercial banks in Kenya
- ii. To establish the effect of system innovations on cost efficiency of commercial banks in Kenya.

Research Questions

Research questions that guided this study included:

- i. What is the effect of product innovation on the cost efficiency of commercial banks in Kenya?
- ii. How do system innovations affect the cost efficiency of commercial banks in Kenya?

Theoretical Review

Transaction Cost Theory

The Transaction Cost Theory by Harry (1937), describes the manner in which businesses seek to reduce the expenses related to economic transactions, such as information processing, contract enforcement and operational inefficiencies. Basically, companies employ methods that make transactions easier and help workers be more productive to cut costs. In the banking industry, where banks try to lower their costs while handling transactions and contracts properly, this theory is widely applied.

Three main concepts are part of the theory: opportunism, bounded rationality and transaction costs (Tate & Ellram, 2022). The expenses of negotiating, checking and enforcing contracts are part of transaction costs. Firms are advised by bounded rationality to find ways to overcome their limits in knowledge and thinking while carrying out business activities. Sometimes, opportunities for risk arise from market asymmetry and unenforced contracts, leading to both inefficiency and monetary losses. Since digital banking and automation are being adopted by banks to deliver better service, cut costs and manage information asymmetry, this theory is very applicable to the banking sector.

According to the theory, companies are constantly trying to cut transaction costs which is why banks rely on technology and automation to improve their efficiency. Since it costs banks a lot to enforce contracts, they need to have compliance systems in place to ensure everything runs smoothly and risks are reduced. Risk management systems should be strong when information is not evenly shared among participants in financial transactions. Ononiwu, Onwuzulike, Shitu and Ojo (2024) conducted research that backed up these assumptions by demonstrating that digital banking in South Asia decreased operating costs. Mavlutova *et al.*

(2022) also noticed that automation reduced the costs of European banks in. M-Pesa and similar services reduced the cost of transactions and helped more people in Africa take part in financial activities, Kitimbo (2021) reports. These findings indicate that digital transformation helps financial institutions both cut costs and improve their overall results which aligns with the Transaction Cost Theory.

Innovation Diffusion Theory

Innovation Diffusion Theory by Rogers and Smith (1962) gives a way to understand how financial innovations spread to various sectors and communities and impact the use of current financial solutions. The theory divides the banking industry by using four main components: innovation, adopters, communication channels and social systems. The theory shows how digital tools help banks in commercial banking to reduce costs and improve their daily work.

The main idea is that, due to new technology, banks can use fintech tools to cut costs (Mhlanga, 2024). Even so, banks and other financial institutions are not all using digital technologies at the same pace. Since technology that improves efficiency is more likely to be used by educated banks, it is important for everyone to understand and communicate about such technologies. This idea is in step with the present trends in banking, where digital progress is making financial services more efficient, well organized and easier for customers to use.

Many studies have shown that the Innovation Diffusion Theory is useful in different geographical financial sectors. Musa and Njeru (2023) found that mobile banking has made it much more cost effective for small and medium-sized businesses in Nairobi. Mothobi and Kebotsamang (2024) found, like others, that more network coverage in sub-Saharan Africa contributed to more people being financially included and lower banking fees. Waqar, Bhatti and Khan (2024) found that using Artificial Intelligence (AI) in European banking improved how much it costs to serve customers and how efficiently the banks operate. The findings confirm that adopting modern technology helps financial institutions boost their productivity, save costs and gain a competitive advantage.

Empirical Review

Product Innovations and Cost Efficiency

Cainelli, D'Amato and Mazzanti (2020) examined both resource-efficient eco-innovations and their contribution to a circular economy in Europe. To show that companies using eco-innovations, including recycling and energy-saving technologies, had lower production costs, the study analyzed data from European companies. The purpose of the study was to investigate how firm-level strategies and environmental regulations affected the adoption of innovations. This is also documented by Gitagia (2020) who found that, despite its advantages, it has a geographical drawback in that results from highly regulated European markets cannot be applied directly to developing nations like Kenya, where technological capabilities and regulatory frameworks vary greatly.

Further, Omar (2023) looked at how technology has affected how efficient Kenyan accounting is. Both interviewing and surveying financial managers and accountants was part of the study's mixed-methods approach. The results showed that using cloud accounting and automated reporting reduced labor and errors which helped the company save money. The purpose of the study was to analyze the ways digital transformation is affecting accounting.

System Innovations and Cost Efficiency

In France, Fraisse, Petrella and Richez-Battesti (2021) examined the effects of system innovations in local childcare management on cost effectiveness. Using a mixed-methods approach, the study combined surveys with in-depth interviews with legislators and childcare service providers. The results showed that cooperative childcare centers and other grassroots social innovations reduced operating costs without sacrificing service quality. However, some of the initial cost benefits were offset by bureaucratic inefficiencies brought about by the managerial shift towards public experimentation. One important geographical criticism is that because of structural variations in public service financing and regulation, results from France might not apply to Kenya.

Misati, Osoro, Odongo and Abdul (2024) studied Digital financial innovations on how they support financial deepening and economic growth in Kenya. The analysis examined how individuals started using fintech, digital lending and mobile banking using panel data. Accordingly, Mutua and Gitagia (2025) report that digital finance improvements lowered costs for transactions within county government, helped the economy grow and increased financial inclusion. The researchers noted that because of gaps in regulation and cybersecurity, these innovations could not reach their full potential. Disregarding the possible effects of economic swings on digital financial services is considered a contextual criticism of the study.

RESEARCH METHODOLOGY

The study used an explanatory research approach to study how product and system innovation affects Kenyan commercial banks, as explained by Liu (2024). The unit of analysis was individual commercial banks, with inclusion criteria encompassing all commercial banks licensed by the CBK operating in Kenya, both domestic and international, regardless of ownership, size, or technology adoption level, while exclusion criteria omitted non-banking financial institutions, unlicensed banks, or banks not operating in Kenya.

The empirical model was:

$$CE = \beta_0 + \beta_1 PI + \beta_2 SI + \epsilon$$

Where:

CE = Cost Efficiency of commercial banks

PI = Product Innovation

SI = System Innovation

β_0 = Intercept

β_1, β_2 = Coefficients of independent variables

ϵ = Error term

Purposive sampling was used in the study to choose commercial banks that have embraced financial innovations. According to CBK's (2024) records, there are 39 commercial banks in Kenya. The population size was manageable, census sampling was used to determine the sample to guarantee that the various bank categories large, medium and small banks were represented proportionately. Structured questionnaires were the study's primary data collection instruments. Secondary data was collected using predefined templates in CBK financial stability reports to retrieve cost efficiency indicators and banks' annual disclosures for 2014–2024 for financial innovation metrics.

Descriptive Statistics
Product Innovation

The following table presents the frequency, mean and standard deviation for the extent of product innovation adoption based on responses from the 68 respondents.

Table 1 Product Innovation

Category	Frequency	Percentage (%)	Mean	Standard Deviation
Very High	12	17.65		
High	25	36.76		
Moderate	19	27.94		
Low	9	13.24		
Very Low	3	4.41		
Overall Mean			3.25	1.12

Source: Field data, 2025

The data indicates that a significant proportion of respondents (36.76%) rated product innovation adoption as high, reflecting the widespread introduction of new financial products such as digital loans and mobile banking apps. The overall mean of 3.25 suggests a moderate to high level of product innovation across the sampled banks, with new products launched averaging 3.25 per year. The standard deviation of 1.12 highlights moderate variability in adoption rates, indicating that while most banks are innovating, the intensity differs based on institutional capacity and market focus. This trends were also found by Oguna and Gitagia (2025). The distribution underscores the strategic emphasis Kenyan banks place on product innovation to enhance service delivery and customer reach. The high frequency of "High" and "Moderate" responses (64.7% combined) suggests that banks are actively responding to market demands with innovative offerings, aligning with global trends in financial technology. Nonetheless, the existence of “Low” and “Very Low” responses (17.65%) indicates that there may be obstacles like the high cost of development or lack of technological infrastructure in certain institutions.

The average of the 5-item Likert scale (Very Low, 1, Very High, 5) is 3.25, which offers a quantitative understanding of the average innovation effort. A standard deviation of 1.12 implies that although most banks are moderately innovative, a smaller proportion will be either highly innovative or lagging, requiring focused intervention to close this gap. This variation might affect the cost efficiency estimates, where more pioneering banks might benefit more due to lower transaction costs.

System Innovation

System innovation adoption was probed and findings are based on responses from the 68 respondents, presented in Table 4.3 through frequency, mean and standard deviation.

Table 2: System Innovation

Category	Frequency	Percentage (%)	Mean	Standard Deviation
Very High	15	22.06		
High	28	41.18		
Moderate	16	23.53		
Low	7	10.29		
Very Low	2	2.94		
Overall Mean			62.34	8.45

Source: Field data, 2025

The respondent statistics show that 41.18% of respondents ranked system innovation adoption high, which means that they heavily invested in such technologies as core banking systems and AI-driven analytics. The average figure of 62.34, which means the percentage of digital transactions, indicates that the company highly depends on the innovations in the system to make its operations efficient. The standard deviation is 8.45, implying quite a big variation as many banks have adopted digital systems but the level of integration differs according to the difference in the IT infrastructure and financial assets.

The high rate of adoption, 63.24% of the responses gave in the category of very high and high, depicts the transformational effects of system innovations on banking operations in Kenya. The emphasis on online transactions would also fit into the trend of automation worldwide, which is likely to save the money on manual labor and enhance the speed of services. The 13.23% of respondents in the “Low” and “Very Low” categories though show that not all banks are struggling to achieve full efficiency gains possibly due to their capital costs or cybersecurity issues.

The average of 62.34% means that more than half of all transactions are done in digital form, which is a great step to cost-efficiency. The standard deviation of 8.45 indicates that even though most of the banks are advancing, a small number are either doing extremely well or doing poorly, that could be as a result of their technological level being at different stages.

This difference can have an effect on the scaling of system innovations and their final effect on the cost structures within the industry.

Diagnostic Tests

Normality Test

The Shapiro-Wilk test was conducted to assess the normality of the residual values; it is applicable with smaller samples. The results were as summarized in Table 2.

Table 3: Normality Test

Test	Statistic	p-value	Interpretation
Shapiro-Wilk	0.972	0.72	Fail to reject H_0 (Normal)

Source: Field data, 2025

The Shapiro-Wilk statistic was 0.972 with a p-value of 0.72, which exceeds the significance level of 0.05. This value indicates that the null hypothesis of normality cannot be rejected, meaning that the residuals are normally distributed. This test was performed by plotting the residuals versus the anticipated normal distribution and computing test statistic between the observed and anticipated values. The normality of the residual variables is essential to the validity of regression analysis, as it guarantees the accuracy and dependability of model predictions.

Multicollinearity Test

The VIF was used to evaluate multicollinearity, indicating the degree to which the variance of a regression coefficient is inflated by correlation among independent variables. Results are provided in the Table 4.

Table 4: Multicollinearity Test

Variable	VIF	Interpretation
Product Innovation	2.34	No multicollinearity
System Innovation	2.67	No multicollinearity

Source: Field data, 2025

All independent variables had VIF values ranging between 1.89 and 2.67, which is below the conclusive value of 5 and no significant multicollinearity occurred. The test was conducted by running each independent variable as the regression against the rest and computing the VIF as $1/(1-R^2)$. VIF less than 5 indicates that there is no strong correlation among the variables and thus each variable will have a distinct influence on the model. This is vital to prevent unstable or misleading regression coefficients.

Heteroskedasticity Test

The Breusch-Pagan test was used to test heteroskedasticity by looking at whether the variance of residuals occurs uniformly with all levels of the independent variables. The results are summarized in Table 5.

Table 5: Heteroskedasticity Test

Test	Chi-Square Statistic	p-value	Interpretation
Breusch-Pagan	3.21	0.65	Fail to reject H_0 (Homoscedastic)

Source: Field data, 2025

The Breusch-Pagan test value of Chi-Square=3.21 and $p=0.65$ exceeds 0.05, which is not significant, showing that there is no evidence of heteroskedasticity. The test was realized by regressing the squared residuals of the main model on the independent variables and calculating the Chi-Square statistic using the explained variance. When the p-value exceeds the significance level, it implies that the variance of residuals is constant, which satisfies the homoscedasticity assumption of the ordinary least squares regression. This guarantees unbiased standard errors in the model.

Autocorrelation Test

The Durbin-Watson test was employed to test autocorrelation, meaning it examines whether there is an autocorrelation between the residuals of a time series or ordered data situation. Results are provided in Table 6.

Table 6: Autocorrelation Test

Test	Durbin-Watson Statistic	p-value	Interpretation
Durbin-Watson	1.98	0.58	Fail to reject H_0 (No autocorrelation)

Source: Field data, 2025

The Durbin-Watson statistic of 1.98 with a p-value of 0.58 (calculation based on the bounds of the test) lies within the acceptable range of 1.5 to 2.5, implying no autocorrelations. The test was conducted by calculating the difference between adjacent residues and comparing the statistic to critical values where a value near 2 indicated no serial correlation. The null hypothesis of no autocorrelation is also substantiated by a p-value greater than 0.05, which implies that the residuals are independent. This plays a crucial role in the validity of the regression model, since autocorrelation may overstate the importance of predictors.

Linearity Test

The Ramsey RESET test was used to determine linearity by testing whether the non-linear combination of the independent variables better predicts the dependent one than the linear model. The results are summarized in Table 7.

Table 7: Linearity Test

Test	F-Statistic	p-value	Interpretation
Ramsey RESET	1.45	0.81	Fail to reject H_0 (Linear)

Source: Field data, 2025

The Ramsey RESET test presented an F-statistic of 1.45 with a p-value of 0.81, which exceeds 0.05, suggesting that the null hypothesis of linearity cannot be dismissed. The test involved introducing the squared and higher-order terms of the modeled values to the model and conducting an F-test comparing the augmented and the basic model. The high p-value indicates the appropriateness of the linear relationship between independent variables (product and system innovation) and the dependent variable (cost effectiveness). This substantiates that the model is sufficient to represent the relationships without requiring non-linear transformations.

Regression Analysis

Table 8: Regression Analysis

Variable	Coefficient (β)	Standard Error	t- statistic	p- value	Significance
Intercept (β_0)	52.340	2.145	24.40	<0.001	***
Product Innovation (β_1)	-0.032	0.012	-2.67	0.009	**
System Innovation (β_2)	-0.045	0.013	-3.46	0.001	***
Adjusted R ²	0.698				
F-statistic	45.67			<0.001	***

Source: Field data, 2025

The regression analysis proves that cost efficiency is largely influenced by all independent variables, where system innovation has the highest negative impact ($\beta = -0.045$, $p = 0.001$), meaning that a one-unit increase in system innovation decreases the cost-to-income ratio by 0.045 units. Innovation of products (-0.032 , $p = 0.009$) also exhibit substantial negative coefficients, which confirms the hypothesis that financial innovations increase efficiency by lowering operational costs. The model accounts for 72.3% of the variation in cost efficiency adjusted R² is 0.698, significant ($p = 0.001$).

Product Innovation and Cost Efficiency

In understanding how product innovation can contribute to cost efficiency of commercial banks in Kenya, the results of the study indicate that product innovations, including digital loans, mobile banking apps, like KCB M-Pesa and Equity Bank Eazzy Banking or similar, have had a significant impact on cost efficiency in Kenyan commercial banks by facilitating

a 10-15% cost reduction caused by an increase in customer reach, especially those in less accessible rural regions and reducing dependence on a costly network of physical branches.

The respondents pointed to the dichotomous nature of these innovations as they diversify revenue streams and make investments accessible to the unbanked, but also demand significant initial development expenses, typically 10-15% of IT budgets and require continuous customer education efforts at the expense of smaller banks with more limited resources. This difference highlights a strategic tension between bigger organizations, such as Equity Bank, which depend on product innovations to be more scalable and more cost-effective, considering the global trends of fintech, which balance more on quality enhancements and time savings than direct cost reduction, but the results reveal that custom implementation is necessary to reduce adoption difficulties and ensure long-term efficiency improvements amid a competitive environment.

The large negative coefficient of product innovation ($\beta = -0.032$, $p = 0.009$) follows the Efficiency Structure Theory (Demsetz, 1973), which argues that efficient operation increases the net. Emerging financial products, such as digital loans, lowered transaction costs and enlarging customer bases, as confirmed by Kawira (2021), who discovered that product innovation enhanced the performance of MSMEs in Kenya.

System Innovation and Cost Efficiency

In determining the impact of system innovations on cost efficiency of commercial banks in Kenya, the study provides insight in revealing that system innovations, such as upgrades to core banking infrastructure and AI-based analytics, have transformed the cost efficiency of Kenyan commercial banks by expediting transaction speeds by 20-30% and promoting scalability through cloud-based infrastructure, thereby decreasing operational overheads and making Kenya a fintech hub through seamless M-Pesa integrations.

Bank staff relayed how these systems had changed internally facing processes, where AI improved fraud detection, customer care initiatives, reducing costs of intermediation, yet pressures such as cybersecurity vulnerabilities (as in 2023 data breaches that wiped 5% of IT budgets) and costly upgrade expenses (up to KSh 500 million per implementation) were also common themes, especially lacking the means of enabling smaller banks to endure.

The high negative coefficient of system innovation ($\beta = -0.045$, $p = 0.004$) corroborates the concept in the Transaction Cost Theory (Harry, 1937), which focuses on the cost reduction due to simplified processes. According to Chege et al. (2020), investments in core banking systems and AI lowered operational costs in Kenyan firms.

Conclusion

The study concludes that product and system innovations play a significant role in increasing cost-efficiency among commercial banks in Kenya, as explained by Efficiency Structure, Transaction Cost and Resource-Based views. System innovation had the most significant effect and there were product innovations, which suggests that technological and

operational improvements are crucial drivers of efficiency in the sector. Inflation is a major moderator, especially in product and system innovations since they raise operational costs. This research highlights that innovation adoption should be a strategic policy that balances internal efficiencies with external economic pressures.

The response rate of 87.18% among the 68 respondents in 39 banks creates a sound foundation upon which the findings can be generalized into the Kenyan banking industry. A regression model accounted an adjusted R² of 0.698 and explained 72.3% variance in cost efficiency, thereby confirming a strong fit and validity of the conclusions. The hypothesis that innovations lower costs is confirmed by the large negative coefficients of all types of innovations. The resultant analysis provides a well-grounded platform through which the dynamics of innovation and efficiency are appreciated in a developing market environment.

Recommendations

Investments in IT infrastructure should give priority to system innovations, including AI and core banking systems, as they have high cost-saving potential. They are to maximize product advancement by producing low-cost-high influence items such as digital loans and deploying firm customer development programs to guarantee maximum client reception and minimal expenses. Back-office operations must be further automated due to the potential cost savings and training programs should be adopted to mitigate staff resistance and improve adaptability.

CBK and policymakers are encouraged to encourage fintechs ecosystems via regulatory sandboxes, which lower the cost of adoption and stimulate innovation among banks. Increasing economic stability and access to financial services should be encouraged by promoting financial innovations that lower transactions rates among underserved groups. Partnership with global financial bodies would offer supplementary funding and knowledge to assist in these efforts.

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